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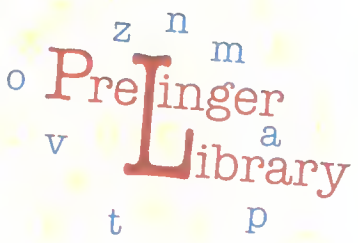
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# RADIO AGE

RESEARCH · MANUFACTURING · COMMUNICATIONS · BROADCASTING



RCA

OCTOBER

1942

# Something in the Air...

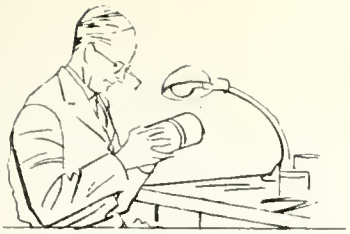
The greatest force that man has ever known for moving men's hearts and minds is in action daily behind the American scene—a household device that brings into tens of millions of living rooms the latest news of our fighting men on all fronts . . . the sublime gifts of inspiring music...the quick tonic of comedy and laughter . . . the welcome relaxation of popular song...blessings all to a nation occupied with the grimmest of tasks.

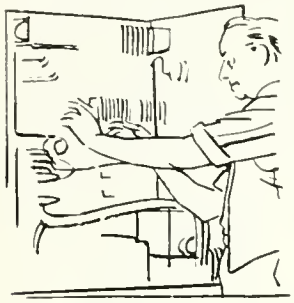
Today, as America's manpower and industrial might begin to make themselves felt on foreign fields, American radio is functioning smoothly, quietly, efficiently, to strengthen morale on the home front and solidify the national purpose for the great drive to victory.

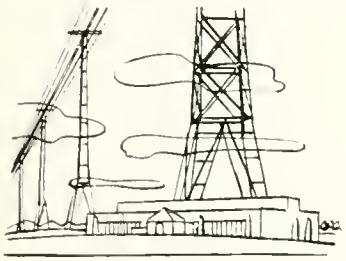
Fittingly, America's oldest network begins its 1942-43 season with the finest parade of programs in its history—many of them shortwaved to the fighting forces by advertisers glad to provide the boys in the field with these tangible links to home, many others fresh from successful summer tours of leading military camps across the country.

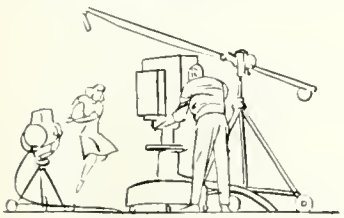
They'll be listened to this year more widely, more eagerly, more gratefully than ever.

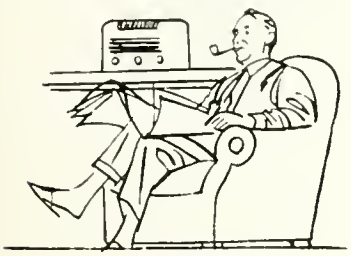
**The Network Most People Listen to Most**











COVER — Lieut. Gen. James G. Harbord and Maj. Gen. Dawson Olmstead inspect equipment in new RCA Laboratories following dedication ceremonies.



# RADIO AGE

RESEARCH · MANUFACTURING · COMMUNICATIONS · BROADCASTING

VOLUME 2 NUMBER 1
OCTOBER 1942

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JUN 30 1949



RCA LABORATORIES, THE NEW CENTER OF RADIO AND ELECTRONIC RESEARCH AND PIONEERING, AT PRINCETON, N. J.

# Dedicate New RCA Laboratories

*MOST MODERN CENTER OF RADIO AND ELECTRONIC RESEARCH IS PLEDGED TO WINNING THE WAR: HARBORD, OLMSTEAD, GRANUM, DODDS, AYDELOTTE, SARNOFF AND SCHAIRER SPEAK AT CEREMONY.*

MARKED on the calendar of RCA history as a memorable date, September 27, 1942, is also an important day in the annals of scientific research and the progress of radio. RCA Laboratories at Princeton, N. J., on that day were dedicated. Open for only a few hours to 500 guests invited to inspect the most modern center of radio and electronic research, the gates were then closed for the duration to all other than war workers.

As the men of science entered to take up their work, they were told that they were as much members of the armed forces as if they were on the battlefield. Their assignments would be military secrets carefully guarded against leakage or intrusion.

When dusk fell over the New Jersey countryside on that September evening, RCA Laboratories stood as much a part of the nation's armament, as an arsenal or fort, dedicated to winning the war and to serve the cause of a victorious peace.

Prophetically, the dedication ceremonies were held in the large studio connected with the television laboratory, where friends of RCA, many of them distinguished in the fields of science and education, military and naval affairs, business and industry, gathered to bid the men of research success and happiness in their new "Electron House."



DR. HAROLD WILLIS DODDS (LEFT), COL. DAVID SARNOFF, MAJ. GEN. DAWSON OLMSTEAD, AND LIEUT. GEN. JAMES G. HARBORD AT DEDICATION CEREMONIES.

### *General Harbord Presided*

Lieut. General James G. Harbord, (U. S. Army, retired), Chairman of the Board of the Radio Corporation of America, presided and introduced the speakers:

Major General Dawson Olmstead, Chief Signal Officer of the Army; Commander A. M. Granum, of the United States Navy; Dr. Harold Willis Dodds, President of Princeton University; Dr. Frank Aydelotte, Director of the Institute for Advanced Study, at Princeton; Colonel David Sarnoff, U. S. Army Signal Corps; and Otto S. Schairer, vice president in charge of RCA Laboratories.

Evaluating the tremendous importance of science in modern warfare, the speakers were high in their praise of the scientists; they praised the vital significance of radio in the global war, and spoke in most confident terms of victory and the great part that electronics and radio are destined to play in the post-war period.

"RCA Laboratories assembles under one roof kindred activities which have hitherto been performed by individuals widely separated by time and space," said General Harbord. "The Laboratories give our future scientific work the advantage of collective effort—the advantage in our attack on our problems of delivering a blow with a clenched fist instead of with open fingers.

"The Laboratories promise much for the future of the radio industry, now so closely tied in with our war effort. And when the lights are once more turned on in this darkened world, we shall take off from here for a brilliant future of which we can now dream but cannot measure."

### *Schairer Looked into the Future*

Introducing Otto S. Schairer, General Harbord said, "I do feel that these Laboratories were a picture in Mr. Schairer's heart long before the first architect put pencil to the plan."



LUCY MONROE LEADS CROWD IN SINGING THE STAR SPANGLED BANNER. ON THE ROSTRUM ARE, LEFT TO RIGHT, DR. HAROLD WILLIS DODDS, COL. DAVID SARNOFF, MAJ. GEN. DAWSON OLMSTEAD (PARTLY OBSCURED BY FLAG), LIEUT. GEN. JAMES G. HARBORD, COMMANDER A. M. GRANUM, OTTO S. SCHAIRER, DR. FRANK AYDELOTTE, AND E. K. JETT.

In his dedicatory address, Mr. Schairer described the Laboratories as a monument to past research, but more than a memorial to past triumphs.

"These Laboratories are concrete recognition that research plays an essential role in modern industry; that it is a vital force for promoting the progress of science and the useful arts," said Mr. Schairer. "They are intended to be a further contribution to industrial advancement and to social betterment by an organization whose services to the public and whose origin and progress have been based upon scientific research and original development.

"Scientific research is diligent quest into the great Unknown. It is the key that unlocks the doors of nature and reveals its mysteries and secrets. It frees mankind from fetters and limitations seemingly imposed by natural forces and by environment. It extends the boundaries and horizons of human knowledge and experience. Research is a modern equivalent of geographical exploration whereby in former times new lands and additional natural resources were discovered and made available.

"Today, RCA Laboratories and its magnificent enrollment of men, buildings and equipment, stand enlisted in the cause of war. . . . But I can give you this prophecy: the scientific progress made here will play a most important part on all the battlefields—on land and sea, under the sea, and in the skies. When the war ends, and the ban of secrecy is lifted, the recital of accomplishments will thrill all of us and fill us with justifiable pride.

### *Hope for Civilization*

"When the war ends—when victory is won—these men and these laboratories will stand dedicated in advance to serve the cause of a victorious peace. Therein lies the distinctive characteristic of our scientific endeavor. . . .

"The triumphs of science warrant our saying—amid all the horrors of war—there is still hope for civilization. To help make that hope come true is the purpose to which these new Laboratories are dedicated."

Major General Dawson Olmstead, Chief Signal Officer of the Army, was introduced by General Harbord as "a distinguished officer of what we young men like to call the Old Army."

Expressing confidence that it will be the continued achievements in the RCA and kindred laboratories "that will unquestionably propel us toward our goal —VICTORY," General Olmstead paid tribute to the foresight and ability of the men who brought RCA Laboratories into being.

"The Signal Corps plays a most important role in this highly mechanized war," said General Olmstead. "It provides for our rapidly expanding Army the most modern design for radio, telephone and telegraph communications

equipment. And the RCA may well be proud of its contribution to the war effort in assisting in making possible for us the finest military communication system of any Army in the world.

"It is well-known that there has never been a time in its history when the research and experiment in RCA Laboratories slackened, or when new products and services were not in the process of development. The result of the work done by the men of the RCA and the significant part in the hidden battle-front of research, is entirely worthy of America's finest pioneering tradition."

Recalling that the Radio Corporation of America, like the Signal Corps, has pioneered in communications, General Olmstead continued:

"When the Radio Corporation of America was formed in 1919, one of its main purposes was to establish a world-wide American radio telegraph system, that would give the United States pre-eminence and a degree of independence in radio communication. The present crisis proves the value of the company's developments in communications, broadcasting, research, engineering and manufacturing, and in rendering service of tremendous importance to our government and to those nations who are our Allies in this war. How this gradual growth and development has worked hand in hand and ear to ear with the Signal Corps of the Army of the United States is proven now by the outstanding performances demonstrated daily in our world communications.

### *Results of Patriotic Effort*

"The problems of conversion which have been met by the RCA from peace to war have been many and varied, but your company has 'beaten the promise' in the production and delivery of war equipment," said General Olmstead. "As a result of this patriotic and efficient effort of the RCA men and women, the Army-Navy's highest award 'E,' which as you know means excellent, well-done, was awarded on September 8, to employees in the RCA Manufacturing plant at Harrison, New Jersey."

In tribute to the scientists and other personnel in RCA Laboratories, General Olmstead said that the Signal Corps knows that whatever communication services can do to help win the war, is being done, and will continue to be done enthusiastically and patriotically. He said that the Government and Signal Corps are instantly benefited by everything that the RCA organization knows and uses in radio communication.

"The war has accelerated, not retarded, the pioneering efforts of our scientists and engineers," continued General Olmstead. "In the past, American inventive genius has been devoted to peaceful pursuits—to the advancement of civilization. However, when pushed into wars, our creative minds continued to function originally in producing instruments of destruction that our enemies have been quick to copy. . . . Communications have rallied the nation. Supplementing the magnificent service of the American press in the coverage of war, radio and Signal Corps communications must be given high recognition for their timely news bulletins and for emergency messages furthering our war efforts.

"As far back as 1939, when only the murmurs of war had reached our shores, your company's management foresaw that RCA must be prepared for an important role in the nation's preparedness program in war production," said General Olmstead. "Conversion of RCA plants, machinery, materials and manpower to meet the government's requirements was planned far in advance of this country's entry into this war."

Reporting that when officers and men of the Navy come in from combat zones, they help those ashore to realize what radio and electronics mean in conflict with the enemy, Commander A. M. Granum of the Bureau of Ships, United States Navy, said:

"This enterprise is very close to the heart of the service. Radio and electronic equipment are vital to our operations at sea.

"We realize we are in competition with an enemy not only in the field of combat but in their scientific and engineering research. In that competition we need team work. . . . It is inspiring to see a laboratory of this sort set up where the best talent and genius of a great organization are brought together to work as one team."

At this point in the program, E. K. Jett, Chief Engineer of the Federal Communications Commission, was introduced. Extending congratulations, he described the Laboratories as a "great achievement."

### *Scientists Welcomed to Princeton*

On behalf of Princeton University, President Harold Willis Dodds, welcomed RCA's men of science to the Princeton community, and expressed pleasure in looking forward to a cordial and profitable association between the University and the Laboratories.

Recalling the laying of the cornerstone of RCA Laboratories in mid-November of 1941, Dr. Frank Aydelotte, Director of the Institute for Advanced Study, at Princeton, observed, "it seems almost like a work of magic in that it has been built so quickly.

"I welcome the scientists who are coming here to this atmosphere and look forward to the contribution you will make to it," said Dr. Aydelotte, "I extend to you a very cordial invitation to visit the Institute for Advanced Study, to mingle with our professors and to ask them for any cooperation we can give you in the work you are doing."

Attending the ceremonies as an officer in active service, Colonel David Sarnoff remarked on the significance

(*Continued on page 20*)



OTTO S. SCHAIRER PLEDGES LABORATORIES TO WINNING OF THE WAR.



PART OF THE CROWD OF 60,000 AT THE RCAM WAR PRODUCTION RALLY.

# 60,000 at RCAM Rally

*EFFORTS EFFECTIVE, NELSON TELLS WORKERS; TRACY, SARNOFF, SHANNON PARTICIPATE IN START OF NEW PRODUCTION DRIVE.*



By J. M. Smith

*Vice President in charge of Manufacturing, RCAM*

WHEN the history of industrial morale activities of World War II is written, a prominent chapter must be reserved for the great rally held at Garden State Park near Camden, under the sponsorship of RCA Manufacturing Company's joint management - labor War Production Drive Committee to Beat the Promise.

Perhaps never before had so huge a throng gathered to attend a production rally. By the time the program was under way, more than 60,000 war workers from the Camden-Philadelphia area, their families, friends, and neighbors overflowed every available foot of space.

The attractions were many: national figures, Soviet and American heroes, a horse race, a dive bomber demonstration, a war show presented by the Army and the U. S. Coast Guard, fireworks, and musical entertainment. But behind the "show" was a serious purpose — the launching by RCAM of the third phase of the Beat the Promise War Production Drive under the slogan of "The Second Front Depends on the Home Front! Beat the Promise!" The speakers stressed that it is the task of military leaders to determine when and where a second front is to be opened; but it is the task of RCA Victor's war workers, makers of vital radio and sound equipment for the armed forces, to make a second front possible — and successful — with production.

Donald Nelson, Chairman of the War Production Board, was the principal speaker. Introduced by Colonel David Sarnoff, Mr. Nelson spoke from a Blue Network studio in New York and addressed an estimated three and one-half million workers from coast-to-coast who are enrolled in War Production Drive Committees similar to those functioning at RCA Victor's plant.

Telling the war workers that their efforts have been effective, Mr. Nelson revealed that war production "has been driven up from Pearl Harbor by 350 per cent.

"This is a good record," he said, "but not good enough. In this game there is



COL. DAVID SARNOFF, INTRODUCING DONALD NELSON, PRAISED PRODUCTION RECORD.

no second prize. We are playing for keeps.

"The United States, which means each and every one of us, is engaged in a fight to the death against the Axis powers. There is no place for Americans in Japan's co-prosperity sphere. There is no place for Americans in Hitler's New Order. For us they mean economic, political, religious, and personal slavery."

Of particular importance to us was Mr. Nelson's discussion of the problems of material shortages.

"There are such shortages," he said, "and there will be more. We must face the facts.

"We have now arrived at what I think of as the balancing period. We have to go over our parts on hand to see what is lacking, what is surplus for the time being. To get balance we will cut down further on materials for civilian use, and, when we must, we will even cut materials for one war use to fill a more pressing and immediate war need. That has already happened in a few instances, and it will be made necessary again. It will mean some layoffs and lost time for workers who are intent on producing for victory.

"You won't like it. I will not like it either. But we'll do it when it is made necessary by the fortunes of war.

"Our material shortages are being attacked by increasing plant capacities, where that is feasible, by shutting down plants serving less essential civilian needs, by improved scheduling, by conservation, and by increasing the emphasis on the production of raw material."

Mr. Nelson paid tribute to the six RCA Victor workers who have won the highly prized certificates of individual production merit award by the WPB for outstanding suggestions which helped speed production. He singled out Benjamin Willett of the Camden plant for special mention.

Before introducing Mr. Nelson, Colonel Sarnoff, who is on active duty with the U. S. Signal Corps, delivered a powerful message to his huge visible and radio audiences.

"You have always got to remember that the stuff you turn out *today*, instead of tomorrow," said Mr. Sarnoff, "can mean the difference between life and death to some American boy on a ship, or in a plane, or on a field of battle.

"In the past most of you here tonight have helped to put the United States out in front of all other nations in radio and electricity. You did that in the days of peace, but our enemies say you cannot do it in time of war. They say that when it comes to war, we are slow and soft and inefficient. They say they can beat us because what we can do is going to be 'too little and too late.'

"That is a lie, and you know it, and this wonderful rally tonight proves it."

Mr. Nelson was followed by Daniel W. Tracy, Assistant Secretary of Labor. Driving home the importance of a good job well done, Mr. Tracy said:

"The smallest screw you drive, the soldered joint you make, the tiniest nut and lockwasher you put on a radio receiving set or transmitter may mean the difference between life and death to the crew of a U. S. bomber.

"No sacrifice is too great, no effort is too strenuous to defend and perpetuate the heritage of America."

The keynote of the entire rally was struck by Robert Shannon, president of RCAM. Addressing the vast audience, he pointed out that three out of every twenty male employees of the RCA organization are now in military uniforms and that it is our responsibility to those boys and their buddies in arms to get them the equipment they need to destroy the enemy.

"There has been a lot of public clamor for a 'second front,'" Mr. Shannon stated. "When, where and how a second front should come into being is not for civilians to say. That is the responsibility of our military leaders, in whom we have the utmost confidence. But we do know this:

"The second front depends on the home front. All of our fronts depend upon the home front. The final victory

*(Continued on page 22)*



SOVIET HEROES, NIKOLAI KRASAVCHENKO AND LIEUT. LIUDMILA PAVLICHENKO, CHAT WITH DR. V. K. ZWORYKIN AND COL. DAVID SARNOFF AT WAR RALLY.

# NBC Reporters Cover the War



CONTROL ROOM ENGINEERS (FOREGROUND) PUT NBC NEWS COMMENTATORS ON THE AIR AT RADIO CITY.



By Clarence L. Menser

*Vice President in Charge of Programs, National Broadcasting Company*

WHEREVER MEN FIGHT in this vast global war—on land, on sea and in the air—there NBC reporters are on the job.

Never before in the history of man has a nation at war been so quickly informed of the cataclysmic fortunes of battle, thanks to the bravery, the daring and the intelligence of these NBC men.

These men have taken NBC listeners into the flame and fire of battle. They have ranged the world from Russia to Africa, from Iceland to Egypt, from Java to Norway to bring their listeners the story of the war as it unfolded from battle to battle.

NBC listeners still remember the first warnings of the war to come in the Pacific in the regular broadcasts from Dick Tennelly in Tokyo. It was NBC's Martin Agronsky who brought them realistic reports of complacency and unpreparedness in Singapore, who fled before the Japs to Java and then to Australia. Few NBC listeners can forget the eyewitness report of the bombing of Manila by Bert Silen, Don Bell and Ted Wallace. And what NBC listener did not thrill to John MacVane's thrilling report of his participation in the recent raid by the Commandos and Rangers on Dieppe?

These are only a few of the more recent feats of a staff of forty reporters who have made the transmission of war news simultaneously with its occurrence.

The work of these men is a far cry from even the recent late 1930's when short-wave reporting was comprised chiefly of occasional addresses by various of the world's statesmen. Since then, wherever the crimson tide of war has spread, there NBC reporters were on the job.

The National Broadcasting Company began assembling its world-wide staff of reporters in the disturbed days before Munich. There was as yet no war but war was in the air. The first NBC reporters brought to their American listeners the day-by-day political and diplomatic maneuverings which were to end in war. As far as censorship permitted, they reported to American listeners the ominous rantings of Hitler and Mussolini. Because of their




IN TIME OF WAR, THE COPY DESK IN THE NEWS ROOM, RADIO CITY, NEW YORK, IS A SCENE OF MUCH ACTIVITY. LATEST NEWS REPORTS FROM ALL OVER THE WORLD ARE RECEIVED HERE AND PREPARED FOR BROADCASTING.

work, American listeners were fully and realistically informed of the tragedy that impended.

As the war clouds gathered over Europe in 1939, NBC already had in operation bureaus in London, England, and Basle, Switzerland. From London, Fred Bate covered the British Isles. From Basle, Max Jordan covered continental Europe.

Jordan was directed to establish European-wide radio coverage for NBC as war became all but a foregone conclusion. There were in those days no tried and experienced radio reporters. Jordan began assembling a staff in the European capitols. He began from scratch. He taught his men how to talk into a microphone; when to talk; how to arrange broadcast facilities, and how to establish impregnable lines of communication. Meanwhile, he commuted by air between all the major cities of Europe, covering the news himself.

NBC's first major test was the Munich crisis in September of 1938. On the night of the signing of the Munich pact, September 29, 1938, Jordan scored one of his greatest NBC scoops. Over NBC facilities, he was the first to broadcast to America the full text of the now infamous Munich agreement. He was a full hour ahead of his rivals.

In the days following Munich, Bate and Jordan worked night and day to establish a competent and comprehensive news staff to cover the holocaust that was to follow. The NBC bureaus in London and Basle were considerably



RICHARD TENNELLY



MARTIN AGRONSKY



JOHN MCVANE



PAUL ARCHINARD



ROBERT MAGIDOFF



JIM WAHL



SIDNEY ALBRIGHT



HARRISON FORMAN



UPTON CLOSE

enlarged. New bureaus were opened in Moscow, Berlin, Paris, Rome, Ankara, Stockholm, Warsaw, Madrid and in the Balkans.

From these reporters, American listeners received an almost day-by-day report of Europe's march to war. NBC men flashed to the United States the first news of Hitler's march into Poland, September 1, 1939. Two days later, they flashed the news of the British and French declarations of war on Germany and Italy.

As the war burst into new fury with Hitler's conquest of Poland, NBC established schedules for European broadcasts. There were regular reports from London, Berlin, Paris and other cities.

NBC reporters brought their listeners a Christmas broadcast from a fortress deep within the Maginot line; also one from Hitler's Siegfried line. They gave their listeners the first sound of British airplanes taking off to meet Nazi airmen in battle.

Listeners to a broadcast by Paul Archinard, then in Paris, were startled by the sound of an air raid warning. Archinard's regular broadcast from Paris was suddenly halted when the siren shrieked its warning. Archinard and the technicians hurriedly left the studio but the microphone was still "live." American listeners to NBC heard the eerie wail of the Paris air raid sirens.

What is probably radio's biggest news scoop, the scuttling of the German pocket battleship, the Graf Spee, was another NBC feat.

No sooner had a British cruiser squadron driven the Graf Spee into Montevideo Harbor than NBC's Jimmy Bowen was on the job. Bowen set up his microphone on the Montevideo waterfront. He broadcast several eyewitness descriptions of the Graf Spee's arrival. Then he stood by to bring his listeners a report of what was to transpire as the hour for the Graf Spee's departure under International Law arrived.

Bowen had just finished a dramatic on-the-spot account from the harbor and signed off as NBC continued its regularly scheduled broadcasting from New York. But, by what is known as a "cue channel," an open radio telephone circuit, contact was maintained between the New York news room and Bowen's position overlooking Montevideo Harbor.

A few minutes passed and then Bowen screamed over the "cue channel":

"Give me the air again! The Graf Spee has blown up! It is being scuttled."

In a matter of seconds, Bowen was on the air again to give American listeners the dramatic story of the scuttling of the Graf Spee in the harbor.

NBC scored another major scoop in the Spring of 1940, but unfortunately it could not be broadcast. Through his own sources of information, Jordan learned that Hitler planned to invade Denmark and Norway. But he couldn't publicly reveal his information.

So, he dispatched a routine radiogram to NBC in New York, announc-

*(Continued on page 24)*



PETER BRENNAN



BJORN BJORNSON



CHARLES LARIUS



RCA LOUDSPEAKERS EXPEDITE THE MOVEMENT OF RAILROAD TRAFFIC AS SHOWN IN THIS SCENE TAKEN FROM A CHICAGO FREIGHT YARD.

# Sound Speeds the War Effort

*MICROPHONE, LOUDSPEAKER BECOME NECESSARY TO EFFICIENT OPERATION OF FACTORIES, AIR FIELDS, NAVAL BASES, ORDNANCE PLANTS; ONE COMPANY AVERAGES 6,000 CALLS A DAY.*



By George R. Ewald

*Manager, Sound Products Division, RCA Manufacturing Company*

THE RAPID TRANSITION to wartime activities throughout this country has brought about many startling changes. Evolution that would ordinarily occur slowly over a number of years now takes place almost over night. New ideas, new processes, new materials, and new man-to-man relationships are rapidly taking form in industrial operations. These changes create new needs and, as is usual in periods of flux, the inventive genius of man responds to the urgent necessities of the occasion.

One of the most interesting developments has occurred in the field of what has been somewhat loosely termed "Commercial Sound." Certainly, the word "Commercial" does not now properly classify the tremendously broad field into which amplified sound has made its entrance so effectively. Today the microphone, amplifier, and loudspeaker are vitally necessary adjuncts to the efficient operation of industrial plants of every description; military projects of all kinds; air fields; naval bases; ordnance plants; proving grounds; training schools; shipyards; railroad yards; amusement, educational, and recreational activities; and,



SOUND SYSTEM CONTROL DESK, WHERE SPECIFIC OR GENERAL CALLS ORIGINATE.



THIS ROOM IN A ROCHESTER FACTORY IS EQUIPPED WITH LOUDSPEAKERS FOR INSTANTANEOUS AND GENERAL COMMUNICATION WITH WORKERS.

in fact, in any inside or outside location where it becomes necessary to convey sound intelligibly to groups of people or over distances where unamplified sound will not serve the purpose.

Commercial Sound has served a fearful as well as a useful purpose. It is indeed doubtful if Hitler's hordes would now be over-running Europe, Asia, and Africa if he had not been able to exercise his almost hypnotic control over millions of people through the use of loudspeakers.

On the other side of the picture, however, the use of amplified sound has become a tremendously important factor in the expediting of production, the improvement of efficiency in organization operation; a most potent time-saver in locating key men in every nook and corner of our great factories; and has tremendously reduced loss of life and damage to property in emergencies. So, a microphone is now found at the elbow of every man who desires to accomplish things quickly and efficiently, and millions of loudspeakers are in use throughout the world, in every place where people gather either for business or pleasure.

Originally when it was found possible to satisfactorily amplify sound and project it for some distance, the field of entertainment seemed to be the most natural development for the use of loudspeakers. As this use grew and developed, the possibilities for educational purposes became apparent, and it was not long before the schools and colleges throughout the country were equipping their auditoriums, laboratories, and individual classrooms with this most useful device. Slowly and gradually the amplifier found a place in various types of business establishments, although at the beginning it was curtailed in most places to the use of intercommunication equipment.

### *Rapid Expansion Develops*

It has only been within the last 24 months that the real possibilities of the amplification of sound in great industrial establishments were realized. This development has proceeded with such tremendous impetus, however, that interesting and even spectacular incidents illustrating the value of sound equipment are developing daily, and the story surrounding the use of such equipment is worth telling.

Perhaps the best description of the varied use of sound equipment in industrial operations can be given by citing specific reports that are now available from many plants that are engaged in full wartime production. Many of the giant buildings that have recently been erected to house production of military equipment, cover great areas of ground with immense rooms unbroken by walls or partitions. Rapid man-to-man contact is difficult because of the tremendous distances and numbers of people involved. Buzzer or horn signaling in code, and the telephone and interdepartmental memo have been tried, but, due to the limitations of time and space, contact has been slow and much valuable supervisory time wasted trying to locate people wanted for quick answers.

Paging executives and key men has now become a fast and efficient process through the use of plant-wide sound systems, and it is interesting to note some of the comments that have been made regarding the actual efficiency in operation achieved in this way. A letter received from one of the big aircraft companies contains the following significant sentence:

> "To indicate the importance of these sound systems in our plants, it is interesting to note that our main plants make approximately 1,500 calls each per day, with the smaller departmental systems making approximately 250 calls each per day, making the total calls of all systems about 6,000 per day."

From another large Eastern industrial plant comes this statement:

> "We also find that our maintenance work is greatly expedited by our ability to reach the maintenance crews and give them orders immediately, no matter where they may be in the plant."

Through the proper installation and use of a sound system the load can be taken off the existing telephone lines. The necessity for new lines is thereby obviated, as well as additional switchboard personnel and telephone lines in-

*(Continued on page 26)*

# New Ideas Come Out of the Blue

*"TEAM SPONSORSHIP" AND "PROGRAMMING ACROSS THE BOARD" ARE SUCCESSFUL INNOVATIONS MADE BY NETWORK; KOBAK GIVES REASONS BEHIND CHANGES THAT BREAK MANY ESTABLISHED TRADITIONS.*



By Edgar Kobak

*Executive Vice President of the Blue Network Company.*

As RECENTLY as January of this year the radio term—"Team Sponsorship"—probably would have occasioned only mild curiosity among men whose business it is to sell time on the air. And the label—"Programming Across the Board"—would doubtless have caused a bit of annoyance to harried program directors, unless to some of them it might have vaguely suggested the fulfillment of a fond dream.

Today, these are not nebulous terms. They are accepted names for innovations in broadcast advertising wrought by the Blue Network since it became an independent organization in January, 1942. Newest of the national radio chains, the Blue crawled out of its swaddling clothes to challenge established tradition and keep its eyes open for anything new that might be worthwhile.

The new Blue is only nine months old. But in that time it has discarded many old theories about network management and originated new departures in selling time and improving its programs. These activities have attracted widespread attention throughout the broadcasting and advertising fields.

Some of these new ideas were brought about by sheer necessity. The Blue had to contend with shortages of equipment and personnel that would have discouraged many a new business venture. The important thing, however, is that the Blue management did not stop to bemoan its handicaps. Instead, it found alternates, which, in many cases, were better than the original.

"Team Sponsorship," for instance, is the sales innovation the Blue Network devised because it found itself born at a time when a great number of national advertisers had no product to offer the public. In a period of institutional advertising and of business decidedly not "as usual," conditions demanded a cooperative plan of radio sponsorship. The Blue's plan enabled manufacturers to keep the public aware of their activities by grouping together in the purchase of radio time.

"Across the Board Programming" is but one of the new ideas that have originated with the Blue Program Department, supervised by that veteran of radio, Phillips Carlin. The term means simply the scheduling of a particular type of program straight across the board, seven days a week. One reason for such programming is to accustom listeners to one kind of broadcast at a given time every day at one spot on the dial. Another reason is to lend variety to the airlanes, for the feature the Blue selects for such programming is always different from the type of entertainment offered at the same time by other networks.

The first important programming of this type was for the Ford Motor Company. The Earl Godwin news period, "Watch the World Go By," was carded seven nights weekly at 8 o'clock, so that Blue listeners could be assured of spot news broadcasts at that time every evening. Incidentally, this method of scheduling, it has been found, also tends to build a new audience in cases where another type of broadcast by other networks has enjoyed a long period of unchallenged popularity.

Still another example—"Lum and Abner." This program, which has recruited a tremendous listening audience, had developed a regular 8:15 p.m. listening habit. Now, "Lum and Abner" are on the air only on Monday, Tuesday, Wednesday and Thursday. So that the audience built for this type of program might not be lured away when "Lum and Abner" are off the air, Carlin provided a similar type of entertainment at the same hour on weekend nights. This supplementary show, "Gibbs and Finney, General Livery," has accomplished every purpose for which it was scheduled.

On the business side, the Blue Network has been a trail-blazer since the first day it operated. We have been able to sell advertisers on the idea of "keep 'em remembering" not only on the team-sponsorship plan, but by the intelligent use of one-spot feature broadcasts. The one-spot plan calls for the airing of important institutional events, such as the awarding of the Army and Navy "E" to manufacturers engaged in war production. Only recently the White Motor Company, RCA Manufacturing Co., the Independent Lock Company, and eleven other firms took advantage of this plan.

In illustrating how the Blue has overcome shortages of equipment, one might note the way we have surmounted the problem of operating without a newsroom of our own. The usual array of teletypes and short-wave facilities not being available to our new network, we made up for this loss by engaging top-ranking news commentators and placing them in key spots on

*(Continued on page 25)*



THE FAMOUS NBC SYMPHONY ORCHESTRA ON THE STAGE IN THE WORLD'S LARGEST BROADCASTING STUDIO, 8-H, RADIO CITY. RIGHT — ARTURO TOSCANINI.



# TOSCANINI RETURNS TO NBC

*Maestro Opens Symphony Season Over Network on November 1; He and Stokowski Each to Conduct 12 Concerts During Winter.*

IF EVER THERE was a time when music was needed and sought after, planners of radio programs believe, that time is now. More people than ever before, it has been found, are finding through music temporary escape from harsh and drab realities in an uncertain world.

A Britain at war reports listening to more concert music in this third year of World War II than ever before in its history. This wartime trend reflects a swing in popular taste away from dance music to Bach, Beethoven, Mozart, Brahms, Wagner. The London Philharmonic, playing nightly to jam-packed audiences in provincial English music halls, finds response greatest in the most heavily blitzed towns.

Cheering news for an increasing army of music lovers in the U. S. is the announcement that there is to be no wartime blackout of the NBC Symphony Orchestra's popular broadcast concerts.

The 1942-43 NBC Symphony season will be formally launched over the NBC network Sunday, November 1, under the baton of Arturo Toscanini, who is slated for twelve concerts during the 24-week season. Leopold Stokowski is to lead the remaining dozen Winter programs.

NBC has frozen a new spot (Sundays, 5:00-6:00 p.m., EWT) for the series. Five preliminary concerts, with guest batoneers, began Sunday, September 27. A 125-station network will carry the concerts, and the short waves will flash them to Latin America.

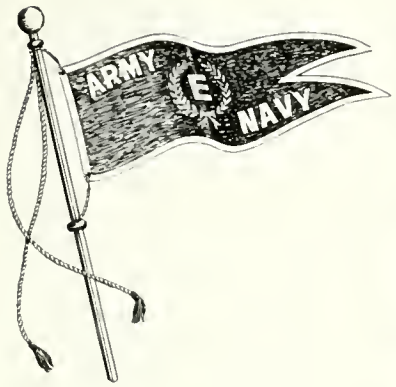
Toscanini will be at the helm November 1 and 8; Stokowski is to take over for five broadcasts starting November 15. Toscanini will return December 20 for an eight-week run, and then Stokowski on February 14 for seven programs. Toscanini is to lead the two final Winter concerts April 4 and 11.

The start of the new series marks the beginning of Toscanini's fifth full season with the orchestra. Stokowski's second. In 1941-42, the only period in which Toscanini was not billed as the organization's featured leader, the maestro took a sabbatical year from broadcasting and Stokowski directed in his stead. Toscanini did, however, lead the group that season in five special broadcasts under U. S. Treasury Department auspices and in the sensational Western hemisphere premiere of Shostakovich's Seventh Symphony.

Return of the unit to exclusive NBC facilities comes after a nine-month absence (save for the Shostakovich event) during which the orchestra was presented over the Blue Network.

# ARMY-NAVY "E" IS WON BY RCAM PLANT

*Radiotron Division at Harrison, N. J., Receives Award for "High Achievement in the Production of War Equipment": Emblems Are Presented to Employees by Army and Navy Officers as Work is Praised.*






SPEAKERS AT ARMY-NAVY "E" PRESENTATION WERE, LEFT TO RIGHT, ROBERT SHANNON, LIEUT. COL. OSCAR C. MAIER, THOMAS F. JOYCE, LIEUT. J. DOUGLAS GESSFORD, MAYOR F. J. GASSERT, AND JOSEPH W. MAYER.

For "high achievement in the production of war equipment," the RCA Manufacturing Company's Radiotron Division at Harrison, N. J., was awarded the coveted Army-Navy "E" in ceremonies at Harrison on September 8. The Camden, N. J., plant of RCAM received the Navy "E" several months ago.

Lieut. Col. Oscar C. Maier, director of the general development laboratories of the Army Signal Corps, Fort Monmouth, N. J., presented the award at a mass meeting of several thousand RCAM employees in Roosevelt Park, Harrison. It was accepted by J. A. King, manager of the plant.

An "E" pin, emblematic of the award, was presented to Joseph Mayer, president of the plant's Employees' Council, by Lieut. J. Douglas Gessford, headquarters commandant, Third Naval District. All employees were to receive duplicates of the pin.

Thomas F. Joyce, vice president of RCAM, was master of ceremonies. Robert Shannon, president of RCAM, thanked the employees and urged the "continuance of your fine work until the war is won." Mayor Frederick J. Gassert of Harrison spoke.

The "E" burgee was raised by members of the plant's War Production Drive sub-committees.



LIEUT. COL. OSCAR C. MAIER PRESENTS AWARD.




STANLEY CRAWFORD



MRS. BONNIE LEE SMITH LEWIS

# 6 RCAM EMPLOYEES WIN HIGH NATIONA



JOSEPH FRANK ECKERT, JR.



EDWARD SPENCER HOFFMAN



ALBERT PETER RUGGIERI

# 'PB AWARDS



BENJAMIN WILLET

## *Certificates of Individual Production Merit Given 5 Men, Woman*

Out of the seventeen persons in the nation to receive Certificates of Individual Production Merit from the War Production Board, five men and a woman (the only one) are members of the RCA Family. In addition, another RCAM worker received Honorable Mention. No other company received as many citations.

The Certificates were awarded for suggestions that increase the quantity or quality of war equipment, or conserve critical materials. This system of awards was established to bring the ingenuity and "know-how" of American workmen at the point of the tool into further service in war production, and to honor production soldiers for outstanding service.

The only woman in the country to be honored with a Certificate is Mrs. Bonnie Lee Smith Lewis, employed at the Indianapolis plant. Her suggestion saved 2,925 man-hours.

Another Certificate winner is Edward S. Hoffman, now Private Hoffman, of the U. S. Army Air Corps. Other winners were Benjamin Willet, Stanley Crawford, and Joseph F. Eckert of the Camden plant. Honorable Mention went to Arthur Waggoner of the Indianapolis plant.

MRS. BONNIE LEE SMITH LEWIS

Mrs. Lewis, 21, a former employee of the RCA Manufacturing Co., Inc., plant in Indianapolis, suggested the use of a motor-driven wire brush wheel for removing burrs found on the moulded clamping nut of a sound-powered telephone. Previously, this operation was performed with a hand scraper, with considerable danger of spoilage. The company reported that Mrs. Lewis' suggestion saved 2,925 man-hours.

## *Suggestions Increased Quantity or Quality of War Equipment*

STANLEY CRAWFORD

Mr. Crawford, 50, a material inspector in the RCA Manufacturing Co. plant at Camden, designed a new type of caliper for determining the wall thicknesses and relationship between a cored interior and the outside surface of castings. By the use of this caliper, 13 out of 16 castings previously rejected were salvaged, thus saving valuable semi-finished material. The caliper also detects shifted cores in rough castings, preventing valuable skilled man-hours being wasted on defective castings.

BENJAMIN WILLET

Mr. Willet, 23, an instructor in the crystal laboratory at the RCA Camden plant, designed a new jig utilizing a diamond-charged saw for slitting quartz crystals. The jig reduced breakage by 75 percent.

JOSEPH FRANK ECKERT, JR.

Mr. Eckert, 24, an X-ray operator at the RCA plant at Camden, suggested a new method to obtain a maximum number of radio quartz crystals from the extremely limited amount of raw material. His suggestion, highly technical, resulted in savings in saw setup time and X-ray measurement time and permitted each bar to be sampled without cutting intermediate wedge blanks. It has shown an increased production of 27 properly oriented crystals a day from the same amount of quartz used previously.

EDWARD SPENCER HOFFMAN

Mr. Hoffman, 22, was a supervisor in the transformer department of the RCA plant at Camden, his interest in the production of transformers for Naval aviation being stimulated by his several applications to get into the air force. Without warning, a high-nickel steel used in the transformer became unavailable and there were no assurances that deliveries would be resumed. Hoffman, although not an engineer, constructed a small lot of transformers with silicon steel in place of the nickel steel. The transformer passed all tests. As a consequence, 3,000 pounds of nickel has been saved and production has flowed smoothly. Meanwhile, Hoffman tried to enlist again and now he's Private Hoffman, U. S. Air Corps.

ALBERT PETER RUGGIERI

Mr. Ruggieri, 23, a spot welder at the RCA Camden plant, suggested the use of a redesigned aluminum bracket in place of a more complicated bracket of stainless steel with a high Chromium content in production of radio equipment. Mr. Ruggieri's suggestion has saved 1,300 man-hours and has conserved a great amount of scarce chromium.

# $10,303,600 IN BOND SALES

*Blue Network's One-Night Campaign Results in Record Total; Sparkling Cast of Entertainers Draws Mountain of Pledges to Support the War.*

AUGUST was supposed to be the month in which the radio industry conducted its big drive to sell Uncle Sam's war bonds. There had been sporadic appeals by networks and individual stations, but when the 29th of the month rolled around the collections had fallen far short of the goal. The situation called for a grand climax drive.

Before August had run its course, the Blue Network, youngest of the chains, had just such a campaign in mind. Without fanfare, its program managers and technicians started planning for a show that would push the industry over the top. Orson Welles was sounded out, and he agreed to act as master of ceremonies for the big bond night. Recruits included Jane Cowl, Carl Sandburg, Dinah Shore, Jack Pearl, Lanny Ross, and a fine surrounding cast.

The Blue Network's office group, with no prospect of glamour but an excellent opportunity to help their country, responded almost 100 per cent to an invitation to work all night on the 29th. Extra desks and telephones were heaped into the Blue offices, maintenance men dusted off three huge blackboards for keeping score of bond sales, and preparations were made for feeding the one-night bond army.

The broadcast was to begin at 9:30 p.m. on the 29th, and was to conclude seven hours later. Affiliate stations from coast-to-coast arranged to wire in their totals. A battalion of office workers virtually chained themselves to the telephones to receive individual orders. Blue officials confided that if they could raise six or seven million dollars Blue Bond Night would be a success.

The Blue team, with Orson Welles calling signals in jam-packed studio 8H, kicked off promptly at 9:30. Down in the network offices, more than 100 persons ran over their signals, like nervous gridders before a big game. At 9:45, 'phones began jangling. Western Union boys blocked for each other to get into the room with wired orders. Edgar Kobak, the Blue's executive vice president, stood perspiring at the big board with his tie unknotted, catching pieces of chalk tossed by a file clerk on the all-night trick. With the other hand, Kobak snagged a wet rag to wipe off the bond sales figures that became antiquated in less than five minutes.

This, some one remarked, was radio in a democracy—at work.

By midnight, the $6,000,000 goal had been passed. The blackboard, sectioned off for returns from "East," "Central," and "Pacific," was a gray smudge. But there were seven figures on the totals now, and that's all that mattered. Except eats. The workers were getting hungry, and when the coffee and sandwiches arrived they staged a local Commando raid. Phillips Carlin, Blue program chief, relieved Kobak at the board.

At 3 a.m., the total was $9,000,000 and only a few of the group managed to get away. The show in 8H had been over for hours, but big-name dance bands were blaring away nationally between bond appeals. The room was littered with empty coffee cups and sandwich wrappers. Tabulating machines clattered merrily and three newspapers called to ask how much had been pledged.

At 9 a.m. Sunday morning a Blue worker, who had checked out of bond headquarters at 5:00, straggled into his office, switched on the lights, and ordered up some breakfast. He was about to bite into a chunk of crisp, brown toast when a 'phone jangled across the room.

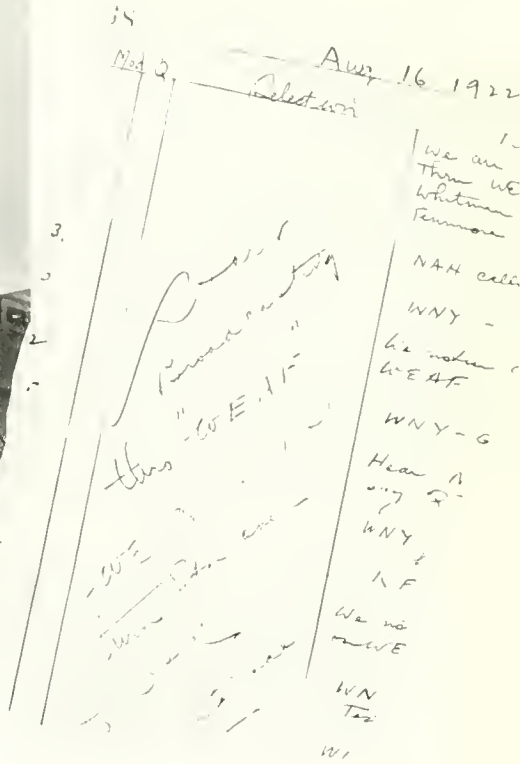
"I heard your broadcast. I want to buy a $50 bond," said the caller. That brought the total up to $10,303,600.

PHILLIPS CARLIN RELAXES AFTER CHALKING UP THE SCORE IN BLUE NETWORK'S "BOND NIGHT" CAMPAIGN, WHICH FAR SURPASSED GOAL.





MISS HELEN GRAVES WAS THE FIRST FEATURED SOLOIST ON STATION WEAF, IN 1922. HER ACCOMPANIST, MRS. MAY W. SWAYZE. RIGHT— EXCERPT FROM WEAF'S FIRST STATION LOG.



# WEAF IN 20TH ANNIVERSARY

*Key Station of NBC Has Been Trail-Blazer in Broadcasting; Solved Revenue Problem Early; New York Girl Wins "Miss WEAF" Contest.*

WEAF, key station of the National Broadcasting Company since its formation in 1926, celebrated its twentieth anniversary in August with a series of special programs and a contest to select a talented girl born in the month of its own creation, August, 1922.

Winner of the contest was Miss Katherine Donaldson, of 32 West 10th Street, New York. Interested in a dramatic career, "Miss WEAF" will be given a promotional build-up to help further her ambitions.

Station WEAF started life Wednesday, August 16, 1922, on the twenty-fourth floor of the American Telephone and Telegraph Company building, 24 Walker Street, New York.

Broadcast through a transmitter at 463 West Street, WEAF's first program went on the air with no fanfare and little indication of the trail-blazing for which it was destined in the radio industry.

Talent was drawn from telephone company employees whose desk work for some time had been interrupted by "SOS" calls from the engineering department to lend themselves as figurative guinea pigs to experiments in voice and music transmission.

Since they worked on company time, artists, of course, were not paid for their microphone appearances in currency, but in courteously-worded cards of appreciation.

WEAF'S first log records merely: "Start broadcasting through 'WEAF' Western Electric Company, West Street," together with remarks required by the Government as to stations and signals picked up during the day.

Precocious WEAF was only 12 days old when it solved the problem of revenue that had plagued radio operators for years—by selling the first commercial sponsorship of a broadcast. In contrast to the commercials of today, averaging 50 seconds, this historic commercial, paid for by the Queensborough Corporation, ran for 10 minutes.

Since its early days, WEAF has been an outstanding member of the American broadcasting system, and has made many contributions to the service of radio in the fields of information, culture, entertainment.




KATHERINE DONALDSON, WINNER OF THE "MISS WEAF" CONTEST.







*Dedicate New RCA Laboratories*
*Continued from page 5*

that the foundations of RCA Laboratories were laid in time of peace—just three weeks before Pearl Harbor—and the superstructure had been raised in time of war. Similarly, he said that the modern sciences of radio and electronics have their roots in peaceful soil, yet today, these sciences, and all sciences, are enlisted in total war.

Colonel Sarnoff said that while the war's decision ultimately will be made on the battlefield, on the high seas and in the air, the fighting men who have the greatest resources of science, engineering and production at back of them will be the victors. This war, more than any before in history, he described as a contest between the brains, imagination and inventive skill of the sciences of one group of nations pitted against those of another group. The United States has been fortunate, he said, in the fusion of its private enterprises and universities, which long prior to the war assembled research staffs and built research facilities, ahead of the emergency over the forces of nature over ignorance, poverty and disease.

"Our country is fortunate in that the officers and men in its military and naval establishments have a progressive attitude toward scientific research," said Colonel Sarnoff. "They realize its possibilities, not only as a factor in war, but also in peace. Indeed the scientists in the Laboratories of the Army and Navy and in the Government Departments themselves have made scientific contributions from which our country has benefited in the past and will continue to benefit in the future."

ing forces, and in the ingenuity displayed by industrial laboratories in developing ways of overcoming problems such as the shortages of critical materials.

"Of all the fertile fields which American men of science have cultivated for peace and now harvest for war, radio is in the first rank of importance," continued Colonel Sarnoff. "Speed of communication—on land, at sea and in the air—is the essence of modern warfare. Aviation, which has so radically revolutionized military and naval strategy, is particularly dependent upon the countless services of radio."

### *Scientists Linked With Victory*

Colonel Sarnoff said that it is particularly fortunate that during the period prior to America's entry into the war, the Radio Corporation of America built up its research organization, and that RCA scientists and engineers gained experience along lines that are now of vital military importance.

"In the last analysis," said Colonel Sarnoff, "a research laboratory consists not so much of buildings and facilities as it does of research men and research leadership. The staff of these laboratories is as fine a group of radio scientists as exists anywhere in the world. They have produced outstanding developments in new electronic devices, television, in ultra-short waves, in acoustics, and in many other branches of radio research. The skills which they developed before the war are now finding direct use in important military applications."

Congratulating Mr. Schairer and his associates upon completion of the Laboratories and the dedication to the cause of Victory, Colonel Sarnoff said that the use to which the United Nations will put them. Then, he envisaged [illegible] science drawing upon [illegible] research to develop final and more useful products and services for peaceful purposes. "Out of the ashes of war," he said, "they will bring [illegible] and better civilization."

With the singing of the Star Spangled Banner led by Miss Lucy Monroe, the dedication program concluded, and the guests were invited to inspect the

building and to meet its many [illegible] service.

A tour of RCA Laboratories reveals their size, magnificence, efficiency and purpose. It is not only a radio laboratory, but also many laboratories which reveal that modern radio is a science spreading into many fields—electronics, acoustics, chemistry, physics, metallurgy and optics, from which grow many by-products and branches—cathode-ray tubes, fluorescent materials, lenses and photography.

The Laboratories building is a 14-story structure with long corridors into which open 150 laboratory bays. To understand what is behind them, the inspection must begin in the basement—as shipshape a one as anyone ever entered. It is the nerve center. Into it through underground arteries of conduits and pipes, are fed the electric power, gas and water supply. Alongside huge water tanks and air-conditioning apparatus are transformers and vault-enclosed power regulators, while the compressed air and steam is supplied from the heating plant. From two 500-foot wells, 600 gallons of water are pumped in a minute.

All the services of electricity, water and gas flow in conduits on the basement ceiling under the main corridor. Proudly, the research men point to 104 vertical shafts, which rise from basement to penthouse, with outlets on each floor. From these, wires and pipes carry the vital services to 420 workbenches each 6-feet long. These unique service shafts are described as a most important feature and development—an original contribution to laboratory construction. In the words of a scientist, they are "a copy of nothing."

Standing at the point where the "T" of the Laboratories structure is crossed, on each of the three floors one looks to the right and left down the 244-foot corridors, or wings. The total length of a corridor from end to end is 488 feet. That is the span across the top of the "T." The doors on both sides of these spacious hallways on all three decks open to the many laboratory bays, and to nine administrative research offices and workshops. On the main floor, the general office section is near the entrance. Executive offices are located on [illegible]

Entering one of the laboratory bays, the visiting scientist is impressed with the spaciousness and broad daylight exposure supplemented by modern incandescent lighting which casts no shadows. The long benches are so designed and arranged as to be in easy reach. A strong metal extends along the top of each bench, and the markings on the panel outlets indicate that almost any phase of electric current—AC or DC, and at various voltages—is at hand to get tops of the experimenter. In addition, there are taps on the bench for city gas and water, as well as hydrogen and oxygen, by the bays where they are used. And, of course, there are convenient electric plugs for soldering irons and other electrically operated tools. Flexibility in construction is the keynote.

The many Laboratory bays indicate a great variety of activity. The Television Laboratory is described as "the last word in facilities for television research." Other laboratory bays are devoted to research in chemistry, especially fluorescent materials; acoustics, radio facsimile, centimeter-wave transmission and reception, receiving tubes, cathode-ray tubes, transmitter tubes, under-water sound, and various activities associated with the future of radio and electronics.

The Model Shop is considered to be the most modern of its kind and most splendidly equipped in the world. For example the Meter Room has complete calibrating equipment and 3,000 different meters available for covering voltage, current, temperature and speed. The Technical Library of the Laboratories is catalogued as "complete in the communication field." The Laboratories has an ultra-modern kitchen which adjoins a cafeteria with a capacity to serve from 150 to 200 persons at a time.

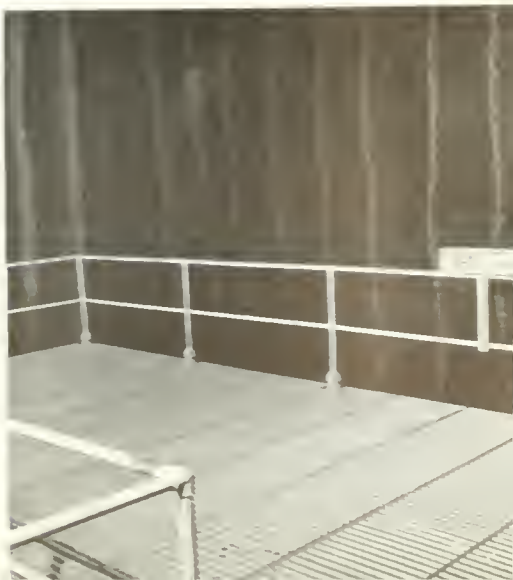
In the words of Colonel Sarnoff: "Our admiration for these Laboratories is based upon more than their obvious fine qualities of architecture and construction. We are moved by the deep respect in which we hold the virtues of scientific accuracy and intellectual integrity. These are virtues possessed to a high degree by the men [illegible] work within these walls."



THE LARGE STUDIO [illegible] OF THE TELEVISION LABORATORIES



CORRIDORS ON EACH FLOOR OF THE LABORATORIES BUILDING ARE 488 FEET LONG



THIS TEST CELL [illegible] IN THE [illegible]

## 60,000 at RCAM Rally

*(Continued from page 7)*

in this war can only be achieved by a unity of purpose; unity of determination; unity of sacrifice on the home front. We shall not fail those who are not here tonight."

In these words, the new Beat the Promise production drive was inaugurated. In planning the campaign, the BTP Advisory Committee, headed by Thomas F. Joyce, Vice President, retained the essential elements of the previous tried and proven Beat the Promise drive. The objective is to make a Second Front possible by getting out more production. Workers are being urged to:

1. Meet and beat production schedules to make a second front possible—and successful.
2. Conserve vital materials, tools, machinery, and time.
3. Be on time every day, to make every minute count.
4. Suggest ideas that will speed production or conserve materials.

Competition between individuals, departments, and plants, will again be the keystone of the drive. Individual and department efforts will be recognized through new merit pin awards and the plant with the best over-all performance each month will receive the President's flag.

The first active step in this new production drive was taken on September 15, when employees received a pledge for their signatures. This solemn pledge, made to the fighting forces of the United Nations, called for the signer to contribute his blood, his money, his sweat and his courage for our ultimate victory.

In Camden, the first elements of the drive began to appear two weeks in advance. On the sidewalks around the factory buildings there appeared the date "Sept. 13?" Posters with this date appeared on the bulletin boards and billboards. Provocative newspaper ads began to appear. Day by day, letters were added to a sign atop the public library adjacent to the plant which finally spelled out "The Second Front Depends on the Home Front! Beat the Promise." Provocative sound system announcements referring to the September 13 date were made throughout the plant.

Soon, posters along the highways announced that a war show was to be presented and that tickets for it could be obtained from RCA Victor workers. Handbills describing the show were distributed. The demand for tickets became so great that all the available supply was exhausted long before September 13.

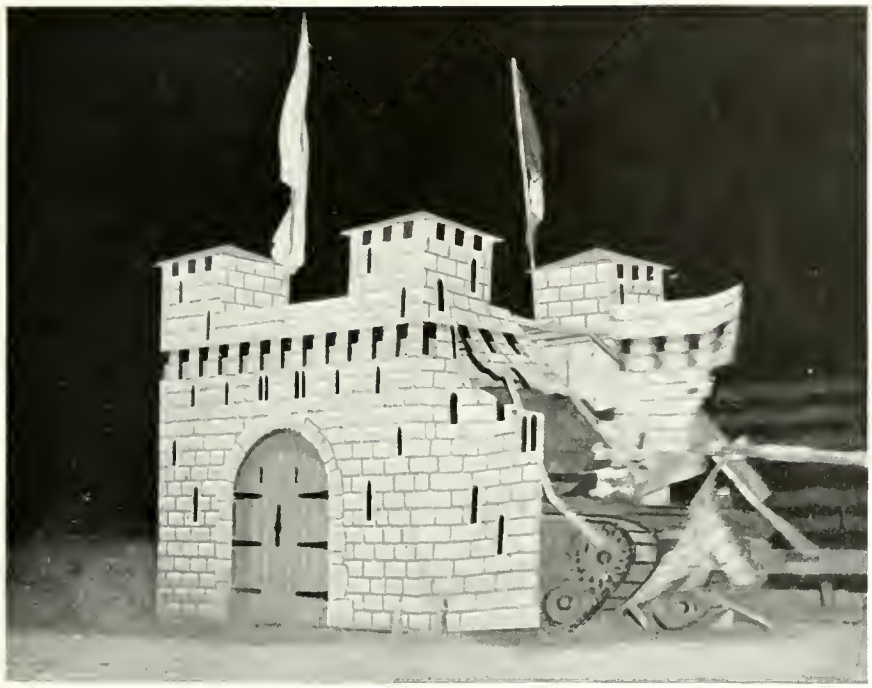
Some highlights of the inaugural program were: the personal appearance of Coxswain John Cullen, U. S. Coast Guard hero who was instrumental in trapping the eight Nazi saboteurs; Lucy Monroe, who led the crowd in a song fest; Alexander Kipnis, famous Russian-American basso and Victor recording artist; and the three Soviet heroes now in this country—Liudmila Pavlichenko, Red Army lieutenant credited with killing 309 Nazi soldiers; Nikolai Krasavchenko, Soviet youth leader, and Vladimir Pchelintsev, crack sniper who killed 152 Nazi soldiers with 154 bullets.

Units of the U. S. Coast Guard and the 385th Infantry of the 76th Division made important contributions to the war show. The feature of the Coast Guard portion of the program, and one that proved unusually popular, was a demonstration of the Coast Guard Dog Patrol.

The troops, under the command of Lieut. Colonel Don N. Holmes, presented a full hour's program of ma-

U. S. COAST GUARDSMEN, WITH HIGHLY TRAINED MEMBERS OF THE DOG PATROL, PARADE BEFOBE RALLY CROWD.





ARMY TANK IS SENT CRASHING THROUGH DUMMY CASTLE-FORTRESS AS PART OF THE SPECTACULAR WAR SHOW THAT THRILLED CROWD.

neuvers and drills, climaxed by an "assault and capture" of an "enemy" position.

An impressive spectacle was the sounding of retreat in which the Army and Coast Guard troops and massed bands participated. As bombs burst in mid-air, and the flag was lowered, Miss Monroe sang "The Star Spangled Banner."

Earlier in the program, the immense crowd thrilled to a dive bomber exhibition staged by the Vultee Aircraft Corporation, and enjoyed immensely the first running of the Victory Stakes in which four horses, ridden by jockeys representing Uncle Sam, Mussolini, Hitler, and Hirohito, competed. Uncle Sam nosed out Hitler at the finish line while Mussolini lagged far in the rear. George Hicks, Blue Network announcer, who acted as master of ceremonies for the rally, gave a post-by-post description of this race.

Out of this rally must surely arise new inspiration for the war workers upon whom our armed forces depend. The fighting speeches must surely be lodged in their minds, the picture of the dive bomber, the smell of gunpowder and the sight of our fighting men must have made a lasting impression. These are things, we believe, that spur men on; these things and the knowledge that they are able personally to make an important contribution toward winning the war.

## "RED NETWORK" OUT AS NBC DESIGNATION

*It Becomes Unnecessary Following Divorce From Blue: Origin Recalled*

NBC, EFFECTIVE September 1, dropped the designation "Red Network," as formerly applied to its affiliated stations. Since the recent separation of the "Red" and the "Blue" Networks (as the National Broadcasting Company and the Blue Network Company) the phrase has become unnecessary.

It was in the horse-and-buggy days of radio communication (circa 1926) that the term "Red Network" came into being. Engineers of the American Telephone and Telegraph Company were responsible for its coinage, and not the National Broadcasting Company. In order to simplify matters the engineers used colored pencil markings to show circuit routings on their maps. Red was used for the NBC-WEAF network, and blue for the NBC-WJZ hookup. Not until some years later did NBC decide to make these two terms more widely known among the public, and such a campaign was started on the air and in advertising and promotion matter.

The publicizing of the term soon brought irate letters from less enlightened listeners. They began to accuse NBC of a lack of patriotism and base designs on the American way of life. Previously these listeners had accused NBC of making the radio waves play strange melodies on their bed-springs, and felling blackbirds while in flight.

Wrote one friendly correspondent who did not view the matter with alarm: "The minds of some people are very easily swayed and I know for a positive fact that your slogan has been grossly misinterpreted. We all know that NBC has been and always will be one hundred per cent American. . . ."

To another letter writer in search of an explanation for the "colors," NBC, with the correct amount of whimsy, wrote as follows:

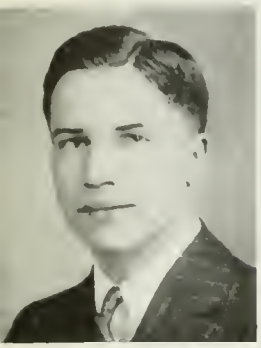
> "The red, white and blue crops up everywhere these days; this patriotic set of colors has entered into every phase of our conscious—and yes, unconscious existence. For proof of the first, just look about you; for proof of the second, we offer the First Aid Manual published by the American Red Cross and listing red, white and blue unconsciousness.
>
> "The Red is now known as the National Broadcasting Company; the Blue functions as a separate and distinct company, and the White is non-existent, save for its use in the past as a designation for certain international facilities. No, Mr.—, we can't be red, white and blue, unless it be red with embarrassment over this 'unpatriotic' situation, white with terror lest too many listeners discover it, and blue to know that we've disappointed you in any way whatsoever.
>
> "With none but the kindest thoughts toward another network, we hope that when you're blue you'll dial to NBC; we strive to remember that despite the headlines, life still has its laughlines!"



ROBERT ST. JOHN




DAVID M. ANDERSON



GRANT PASS



JOHN VANDERCOOK

## NBC Reporters Cover the War

*(Continued from page 10)*

ing that he was going to Denmark to look for a story. No dullards, the New York news staff at once interpreted Jordan's cable as the tip-off of the forthcoming invasion. NBC reporters were quickly dispatched to the danger spots. The invasion came within a few days, just as Jordan had predicted. And our reporters were on the job in Norway and Sweden.

When Hitler smashed into Holland, Belgium and France, NBC's reporters covered the invasion from all fronts. They brought American listeners one of the last broadcasts out of Holland. They continued broadcasting from Paris until the Nazi troops took over. Helen Hiett left the French capitol literally only a few yards ahead of the advancing Nazis.

With the fall of France, NBC expanded its news staff throughout the Balkans. Martin Agronsky, the doughty Rutgers University graduate, who did his first broadcast for NBC in 1939 from Geneva, was sent to Belgrade and then to Ankara. Reporters were stationed in Bucharest, Budapest and Athens to cover the Balkan war.

At Ankara, Agronsky made radio broadcasting history. There, in virtually the last remaining neutral capital in eastern Europe, Agronsky found himself in a strangely advantageous position to gather news of all the belligerents. He could attend functions where Axis and Allied diplomats still rubbed shoulders. Agronsky's broadcasts were packed with so many daily scoops that they became "must" listening for American newspapermen and diplomats.

As exciting a reportorial life as Agronsky had at Ankara, it was dull compared to what he was later to encounter in Hong Kong, Singapore, Java and Manila. Agronsky was never a man to pull a punch. He may have angered some but he was later proved correct in his assertions that easy-going life in Singapore was not enough to stop the Japs. One of his broadcasts reporting that American warships in the Far East were using ammunition that had deteriorated through age aroused Congressional repercussions but resulted in an official acknowledgment of the accuracy of his statements.

When Hitler struck at Russia, NBC already was on the job. Robert Magidoff was in Moscow to bring American listeners the official Soviet reports of the progress of the war. When Moscow was threatened in the winter of 1941, Magidoff went to Kuibyshev with the official Russian government entourage. NBC in New York had meanwhile perfected arrangements through RCA Communications to bring Magidoff's voice to the United States either across the Atlantic or Pacific, by whichever route atmospheric conditions were better.

Magidoff is in the NBC tradition—he's no arm chair reporter. He has visited the Russian fighting fronts and seen for himself what goes on. He has brought American listeners the first reports of the prowess of American arms in the hands of Russian fighters. He is frequently quoted by Red Star and other official Soviet publications, a tribute to his accurate reporting.

Incidentally, it was Magidoff who initiated the negotiations by which NBC obtained the Western Hemisphere rights for the first performance of Dmitri Shostakovich's Seventh Symphony by Maestro Arturo Toscanini and the NBC Symphony Orchestra.

As Hitler drove deeper into Russia and negotiations between the United States and Japan neared the breaking point, NBC eyes were turned to the Pacific. Late last fall, reporters were hurriedly dispatched to outposts in Java and Batavia to supplement the staffs in Chungking, Tokyo, Manila, Honolulu and Hong Kong.

### *Reporters Mobilized*

Then came December 7.

Within seconds, NBC reporters at home and abroad, wherever stationed, were mobilized to report the latest developments, to analyze world reaction, and to report from the battlefronts.

Within an hour of the Jap attack on Pearl Harbor, we were receiving direct reports from Bert Silen and Don Bell in Manila and Jim Wahl and others at Honolulu. NBC men were rushed from Chicago, Denver and Hollywood to San Francisco to establish a fully-manned operating point for Pacific Seas operations. In the early morning of December 8, Army and Navy headquarters at Washington were manned by NBC reporters. A special 24-hour telephone circuit was established at Washington so that Army and Navy information could be got to the microphones within a matter of seconds after release.

On December 8, Silen made eight broadcasts from Manila, setting a pace which was followed until that hapless city fell to the Japs.

On December 9, Silen and Bell wrote another glorious chapter in the history of NBC broadcasting with their eyewitness description of the bombing of Manila. American listeners heard the crack of bombs and the rattle of anti-aircraft fire as Silen and Bell, assisted by Wallace, stayed on the spot to describe what their eyes saw.

These men stuck to the last, spurning chances for evacuation. Bell was reported bayoneted to death by the Japs by the late Melville Jacoby of Life magazine, himself a former NBC reporter. Silen is a prisoner of the Japs in Manila. And Wallace was last heard from retreating to the hills beyond the city with American troops.

A letter which Silen wrote to NBC in New York last November tells the story of this NBC man's devotion to his duty better than anything anyone else could write.

"Arrangements completed," he assured NBC. "I can broadcast at any time, even during actual bombing, unless main power supply is destroyed. Will use special bomb-proof broadcast site. Have made arrangements for anti-aircraft guns to protect our position."

On that fateful day of December 7, NBC reporters all over the world reported to America. Wahl and Loren Thurston were heard from Honolulu. Then followed Sidney Albright from Batavia, John Young from Singapore, Harrison Forman from Hong Kong and Ed Mackay from Shanghai. Mel Jacoby spoke from Chungking. Dick Tennelly in Tokyo had already been interned. He has since arrived in this country. But Mackay is still interned in Shanghai at last reports.

### *Scoop on Dieppe*

NBC's newest scoop was the raid on Dieppe. Five days before the raid Robert St. John in London notified the NBC news room in New York not to expect any reports from MacVane until further notification. The reason was apparent when the radiogram came that MacVane had arrived at an unidentified British port and was ready to report on Dieppe. The report of the Dieppe foray by MacVane was heard on NBC and repeated on the Blue Network. MacVane was the only American radio reporter to accompany the Commandos and Rangers.

NBC reporters have done a magnificent job but there's a bigger one ahead. That job is to report the remaining days of the war without bias, without prejudice, without fear and without favor.

And when the war is finished, there's the peace to be won.

Niles Trammell, President of the National Broadcasting Company, has already envisaged the possibilities of reporting the peace by radio. Mr. Trammell believes NBC microphones should be at hand to report the negotiations from day to day to the American people. In such a way, he believes, lies assurance for a free peace, written by free people, for a free world.

The radio of the future will be even more world-wide in scope. Our coverage of the news internationally will be intensified and only the limits of the globe will bound the peregrinations of our reporters.

## *New Ideas Come out of the Blue*

*(Continued from page 13)*

our schedule. Raymond Gram Swing, the distinguished news analyst, was added to our group of newsmen, and with such noteworthy commentators as Dorothy Thompson, Walter Winchell, Drew Pearson and Earl Godwin we are in a position to offer our listeners the best in this type of informative broadcast.

At the time of our separation from NBC, 116 stations were affiliated with the Blue Network. Since then, 18 new stations have joined the Blue and 5 have been lost to other networks. We haven't many 50,000 watters, but those we have are located in the places where they are really needed and where they fully justify their cost. The Blue gives a primary coverage of 17 out of 50 leading markets, and serves a total of more than 21,000,000 radio families across the nation, approximately 71 per cent of the radio homes in America.

Since the first of the year, the Blue has added 23 advertisers to its list of sponsors, more than any other network. Outstanding in interest to the advertising business, in addition to the Blue's signing of the first seven-day-a-week sponsored program on record, was the largest time sale in point of hours-per-week to any individual sponsor.

## NBC Program Ratings Climb

CROSSLEY RATINGS for NBC programs, in the first seven months of this year, show a material increase over the corresponding 1941 period. Total ratings of all NBC programs are 6.8 per cent better than last year, while the average NBC program rating has gone up from 13.7 to 14.9, a gain of 8.8 per cent.

## Blue Gets Legion Award

THE BLUE NETWORK on September 21 received the American Legion Auxiliary's seventh consecutive Radio Award as the network which has made "the greatest overall contribution to our war effort."

The award, an engraved plaque, was presented to E. R. Borroff, vice president in charge of the BLUE's Central Division, by Mrs. Eben P. Keen, chairman of the Auxiliary's National Radio Committee, at the Municipal Auditorium in Kansas City.

Each of the four national networks competed for the award by submitting the names of radio series, consisting of four or more programs, which would tend to "awaken the complacent, inspire confidence and increase production for the war effort."

## RCAC in Bermuda Circuit

DIRECT RADIO TELEGRAPH service between the United States and Bermuda, one of the key Atlantic outposts of the nation's armed forces, was inaugurated August 10 by RCA Communications, Inc.

The new radio message circuit linking New York and Hamilton is operated at this end by RCA Communications and in Bermuda by Cable and Wireless, Ltd., which also is RCA Communications' correspondent in Great Britain and in a number of other foreign lands.

Operation of the circuit greatly facilitates the handling of message traffic between the two points. In the past, telegraph service with Bermuda was operated by wire and cable via Canada.

*Sound Speeds the War Effort*

*(Continued from page 12)*

volved for intra-office and plant use.

A plant manager speaks in the following terse but effective words:

> "The primary function of our sound system is paging. This averages 1,000 calls per day. It is estimated that five minutes time is saved on each call, or a total of approximately eighty man-hours per day."

Hundreds of similar quotations could be produced, emphasizing the increased efficiency in operation that comes with procedure control by means of industrial loudspeaker equipment. What could be more convincing than this excerpt quoted from a letter received from a superintendent of a big steel mill:

> "The RCA sound equipment in our mill has been in operation approximately 1½ years. I feel that since this installation has been made, 95% of the mistakes formerly made, due to errors in signaling from the heaters to the rollers, have been eliminated."

The modern industrial plant today is subject to many stoppages of work due to emergencies of various kinds. Fortunately, air raid warnings so far have been entirely a matter of test procedure. Undoubtedly these tests will save lives if hostile airplanes finally should be able to break through our defenses. The quick control of thousands of people, and the proper instructions for the guidance of these people, can only be made possible through the use of sound equipment. There are also other emergencies due to fires, explosions, power breaks, and other unusual happenings. Centralized sound equipment provides the best and safest answer to the proper control and handling of such emergencies. It has proved its worth many times in actual installations.

Military projects of every kind are now using sound equipment for many purposes. In camp, where trained buglers are not always available, the stirring strains of reveille are played over the loudspeaker from a record made for that purpose. Field maneuvers can be directed over wide areas through the use of mobile equipment, and in a number of large camps the entire camp has been sectionalized and covered with sound equipment so that the camp commander can address the entire personnel of the camp, or the various unit commanders can handle their separate sections individually.

Sound equipment is indispensable at the large air fields, and an interesting development of this use is the ability to instantly control with one emergency switch the entire system for such purposes as direction of personnel in the case of crash landings, or other emergencies of a similar nature.

The amplification of recorded music and the distribution of this music throughout large industrial plants has attracted much attention recently. It is estimated that about 3,000 factories in the United States are now using music for this purpose, and much interesting data has been compiled as a result of this use. Many magazine articles have appeared on this subject.

Schedules have been worked out showing the type of music and the proper times during the day at which these programs should be heard. At many plants during the lunch hour, news commentators and other current programs are reproduced over the sound system, and quick-step marches are often played as the workers assemble in the morning or leave at the end of the daily shift.

A number of broadcasting stations are now reproducing musical programs for the benefit of workers on the night shifts. Apparently the day is fast approaching when national advertisers will seize the opportunity now afforded through the reproduction of programs of this sort to thousands of industrial workers throughout the nation.

Safety talks and messages can be broadcast regularly to all employees, and large insurance companies are now devoting a great deal of study and attention to the possibilities afforded in this way of emphasizing safety precautions and improved health habits.

Cordial cooperation between management and labor is a tremendously important factor in the speeding up of war activities, and the Government has given its stamp of approval to cam-

STRATEGIC CONTROL POINTS, SUCH AS THIS POWER ROOM, ARE BEING EQUIPPED WITH TWO-WAY SOUND SYSTEMS TO HEIGHTEN EFFICIENCY, SAVE TIME.



paigns based on building morale and the improvement of employer-employee relationship. These campaigns are largely based on mass meetings of employees and the broadcasting of speeches, songs, talks by men in the armed services, and top Government officials. Obviously, such programs are impossible without the use of plant-wide sound systems, and the personnel directors in the large companies are quick to seize upon this method of stepping up morale.

Campaigns designed to stimulate productive activities are efficiently carried on through the use of sound systems, and even though plants are thousands of miles apart, officials can participate and be simultaneously heard in all plants. The quotation below, which was contained in a letter received from the superintendent of one of the big U. S. ordnance plants, summarizes the value of sound equipment as effectively as can be imagined. He says:

> "With this installation it was possible for us in the average time of 120 seconds to reach the many officials, contractors, foremen and other individuals who were moving about the 2½ square miles of territory comprising this project. It was also possible for us to give the instructions to all the thousands of employes at work on this project at one time while work was in progress. On one occasion we assembled 8,000 workmen on 20 minutes notice who could have been reached by no other method. Our ability to contact individuals or groups of people has materially speeded construction and has saved thousands of dollars through increased efficiency."

The progress and development in the use of sound systems which has proved of such great importance in this period of wartime activities, is certainly only the forerunner of even greater and more widespread development in the years to come. There are vast fields of activity that have hardly been touched up to the present time.

Sound equipment has been installed in a few railroad yards and the actual use in these yards has already demonstrated the possibilities of time and labor saving in every type of railroad operation. Here, certainly, is a tremendous field to be developed, and one that will pay large dividends.

Already sound installation is playing an important part in the great inland waterways of this country. On both lake and river, tug boats and tow boats are working day and night moving great accumulations of freight by water. Many times the pilot or navigator is hampered by poor visibility and great distances between his location and the various barges or other bottoms he is handling. The lookout at the microphone stationed at the bow or stern of his fleet helps materially in the safe and efficient passage of these cumbersome craft through the water.

### *Looking into the Future*

Shipyards cover vast outdoor areas, and here the problem of communication is particularly difficult. Practically every large shipyard in this country is now wired for sound, and the flexibility of this equipment permits it to be used in the remotest corners and even on board the ships under construction.

Complete intercommunication between all important desks in the large offices and warehouses not only facilitates the dispatch of all ordinary business, but actually is a great money saver in decreasing the number of telephone units in use, and relieving the ever present load on switchboard facilities. It also frees the telephone lines for trunk line use, which is by far the most important service the telephone renders.

Looking into the future, it seems safe to predict that the up-to-date architect will provide all future buildings, whether they be for business or residential purposes, with completely integrated sound systems. Outlets for sound will be provided just as outlets for electricity are arranged, and it will be comparatively simple and inexpensive to connect speakers to these centralized systems as the occasion requires. The housewife in the modern home will save countless steps and time, as she can sit in her bedroom or living room and talk to salesmen at the front door, or converse with the maid in the nursery or the cook in the kitchen. In the more elaborate homes, she, of course, can direct her instructions to the servants' quarters or to the chauffeur in the garage. Speakers in each room will be switched on and off as desired, for the reproduction of radio or recorded programs from a centralized control station. These speakers, of course, can be recessed behind attractive grills in the original construction of the house, and thus prevent any unsightly accumulation of individual baffles and wires.

Amplified sound is destined to play such an important part in our daily lives in the future that probably twenty years from now it will seem impossible to believe that we could have gotten along without it. It will have its recognized place in the home, office, and factory, just as electric lights, running water, heat, and refrigeration now do.

In many ways that cannot be told now, sound equipment has enlisted for the duration. This same equipment that is now helping to win the war will emerge in the post-war era in the form of finer and more adaptable equipment, its value and usefulness better understood.

## Blue Programs Aid War

DURING THE TEN MONTHS between October 1, 1941, and July 31, 1942, the BLUE Network devoted 511 hours and 54 minutes to the war effort. The time used for this purpose steadily increased during the 10-month period. For example, government departments, including the Treasury, used 10 hours and 55 minutes in October, while in July the total was 28 hours and 45 minutes. Sustaining programs tuned to the national effort occupied 15 hours and 30 minutes in October and 24 hours and 15 minutes in July. Time was also used by outside organizations and in sponsored programs and miscellaneous announcements. The largest amount of time, 167 hours and 22 minutes, was devoted on BLUE sustaining programs.

The monthly report for July reveals that 105 hours and 14 minutes were devoted to the war effort on Station WJZ and the BLUE. Total network time, including 72 hours and 55 minutes sustaining, and six hours and two minutes sponsored, was 78 hours and 57 minutes, and total local time was 26 hours and 57 minutes.

## FISHBEIN HEADS GROUP TO ANALYZE PROGRAMS

*Viets and Overholser Also On Committee Named by NBC to Determine Morale Qualities.*

A NEW AND SCIENTIFIC approach to the morale qualities of network broadcasting was announced September 30 by Niles Trammell, president of the National Broadcasting Company, with the formation of an advisory committee headed by Dr. Morris Fishbein, editor of the *Journal of the American Medical Association* and *Hygeia*, the health magazine, and a leader of the medical and public health world.

Associated with Dr. Fishbein will be Dr. Henry R. Viets, noted Boston neurologist, who lectures at the Harvard Medical School and is Neurologist to the Massachusetts General Hospital, Boston. The third member of the committee is Dr. Winfred Overholser, famous psychiatrist, who is Professor of Psychiatry, George Washington University School of Medicine in Washington, D. C., Superintendent of Saint Elizabeth's Hospital, in the same city, and member of several distinguished medical societies.

The committee will work under the supervision of Dr. James Rowland Angell, Public Service Counselor of the National Broadcasting Company, President Emeritus of Yale University and noted educator.

In announcing the formation of the committee, Trammell stated:

"The National Broadcasting Company believes that radio broadcasting is one of our most important tools in the winning of the war and that its informational and morale stimulating values are of profound importance at this time. We expect this committee of scientists to study and analyze all NBC programs, particularly in relation to the national welfare and the war effort and to make recommendations to the company for the betterment of our broadcasting efforts. These distinguished doctors, we feel, will bring to us a constructive approach, particularly in the fields of public health and morale."

Commenting on his appointment as chairman of the NBC consulting committee, Dr. Fishbein said:

"Millions of people take their leadership and inspiration from the addresses, entertainment and drama which come to them by radio. Scientific study focused on these programs should help toward intensification of those factors most beneficial for the public of a nation at war. Radio is essentially the medium from which the family as a group obtains a stimulus to better living and hygienic thinking. The consultant group will advise regarding aspects of various programs definitely related to these considerations. Its contribution represents a logical extension of the education program already so well established by NBC and widely recognized under the leadership of President Angell."

In referring to the committee, Dr. Angell said:

"The obligations of radio to the nation — and especially in these troubled times — make it imperative that we should conscript all available intelligence to assist in the execution of its task. The distinguished experts who have accepted appointment to this committee are peculiarly fitted to render assistance of high value."

## 25,000 SERVICE MEN TAKE FREE NBC TOURS

*Number Includes Several Thousand Seamen of United Nations Merchant Marine*

NEARLY 25,000 members of the armed services of the United States and her allies, as well as several thousand seamen of the United Nations merchant marine, have been the guests of the National Broadcasting Company since Pearl Harbor.

NBC was the first large entertainment producer to remember that the seamen who man the transports carrying supplies to our war fronts were as fully entitled to the courtesies of NBC as the soldiers, sailors and marines. Arrangements were made through the Merchant Seamen's Club for free distribution of tickets for tours of Radio City and for broadcasts, and the merchant seamen eagerly snapped them up.

The long Labor Day weekend, the first such prolonged holiday since the United States entry into World War II, found hundreds of service men crowding NBC for the guided tours and broadcasts. Word has spread throughout the services and the merchant fleets that there is open house at NBC for men in the services.

Many of the soldiers, sailors and marines receive tickets for the tour and broadcasts through the New York City Defense Recreation Center, 99 Park Avenue, which is given a daily supply of tickets. Others simply walk into Radio City where their uniforms have been an open sesame for tours and broadcasts.

The visitors have included the group of British Commandos and Naval and Flying heroes that visited the United States in behalf of War Bond sales, as well as hundreds of commissioned officers who have toured NBC. Among the latter were Maj. Gen. Lewis B. Hershey, head of Selective Service, and Maj. Gen. Sandeford Jarman, second in command of the First Army and head of all Anti-Aircraft Defenses, Eastern Theatre of Operations.

American service men seem to enjoy broadcasts with comedy touches while those of our Allies favor musical productions. This is particularly true of the Norwegians, Danes and British and the merchant seamen.

In addition to supplying tickets daily to the New York City Defense Recreation Committee and the Merchant Seamen's Club, the National Broadcasting Company also allots tickets to the Masonic Service Men's Club and Sloane House, largest Y.M.C.A. in the world.

## RCAM Saves Rubber

A SEMI-PLASTIC MATERIAL, made from alcohol and especially tailored after months of research, has been put into service to release large quantities of rubber on the intricate machines used in making RCA radio tubes. RCA engineers, working with engineers of the Resistoflex Corporation, developed the new material, which now has longevity and other distinct advantages over the rubber formerly used.




RCA Laboratories Develop, Install First Electronic Clock

*A novel electronic clock is installed in the new RCA Laboratories in Princeton, N. J. This ultra-modern timepiece equipped with more than 170 electronic tubes counts the 60-cycle pulsations of electric current, and indicates that count in terms of seconds, minutes and hours by means of lights. It has no moving parts, no motors, wheels, main spring or hands. Scientists say the electronic principles involved may form the basis of the household clock of the future. Blinking lights "tick off" the seconds on the line shown from 1 to 60, while other lights denote the minutes and hours. Pictured here with the clock is Dr. V. K. Zworykin, Associate Director of RCA Laboratories, who with his staff developed it.*

## RCAI TRAINING NAVY, MARINE CORPS MEN

***Graduates of School Already On Duty With Fleet; Total Institutes' Enrollment 2,100.***

WITH GRADUATES already on duty as rated radio men with the United States Fleet, the RCA Institutes' Navy School reports a current enrollment of more than 800 enlisted personnel of the Navy and Marine Corps in its student body. Present schedules call for the acceptance of 240 additional enlisted men for training each month.

A new record registration occurred with the opening of the regular fall term of RCA Institutes at Varick Street, New York, on September 8. More than 700 new students were enrolled, raising the total number in attendance to more than 1,300. Institutes officials called attention to the significant fact that registrations include a substantial number of women.

Analysing the greatly increased interest in the technical courses offered by the Institutes, the management breaks down the enrollment as follows:

Young men who expect to enter the armed forces and who wish to prepare themselves for technical assignments; young men who feel that radio training may help them attain commission rank; men who have had no particular trade, and now feel that there is a good chance to get a start in the radio industry; men who are not eligible for military service for physical or other reasons, but who wish to do their part in the war effort by working at radio; and both men and women who feel that a knowledge of radio code and radio mechanics will help them render important civilian defense service.

## LATIN AMERICANS GET RCAM NEWS PROGRAMS

*Series Presents Associated Press Service on Big Stations in Southern Hemisphere.*

A NEW SERIES of radio programs featuring Associated Press news was started October 1 in five important Latin American cities under the sponsorship of the RCA Manufacturing Company. The programs are being broadcast over Radio Nacional, Rio de Janeiro; Radio El Mundo, Buenos Aires; Radio Nacional de Agricultura, Santiago, Chile; XEQ, Mexico City, and CMQ-COCQ, Havana, Cuba.

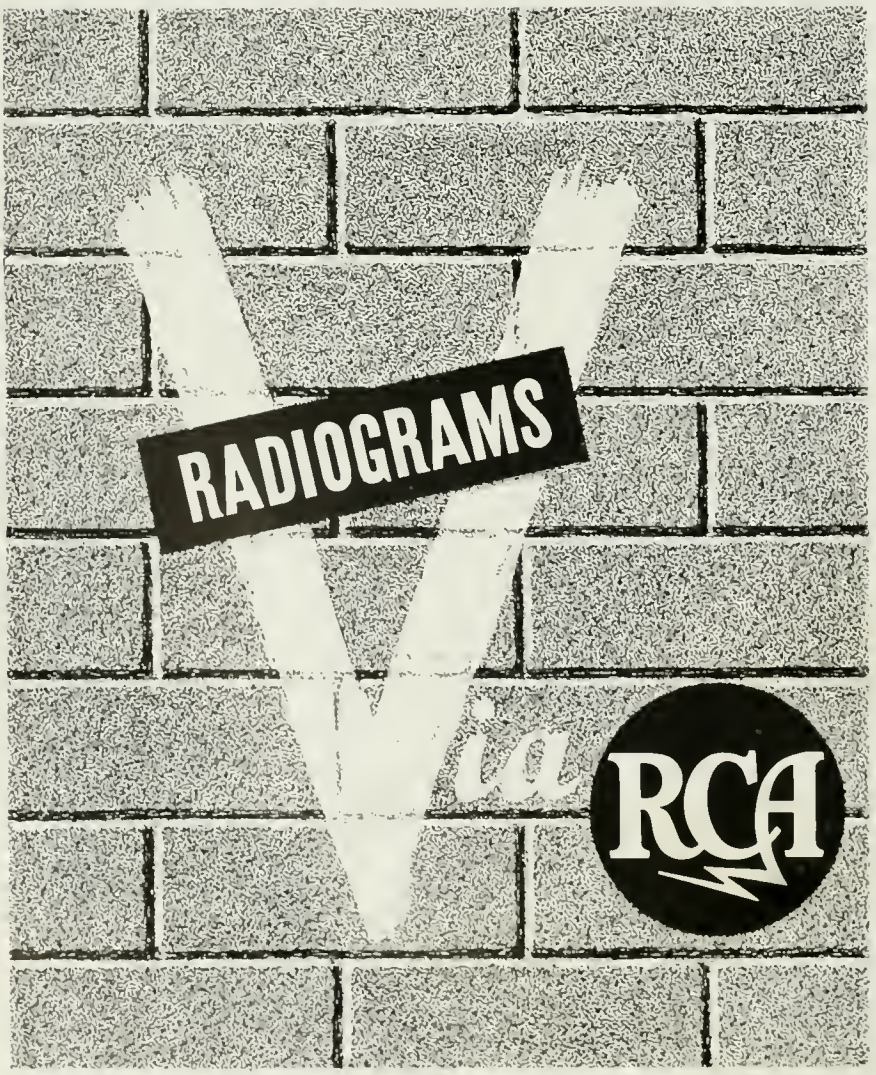
The latest news of the world, as well as national and local news received through the facilities of the Associated Press, RCA Victor officials say, contribute toward establishing the programs among the most outstanding presentations on each station.

The news is broadcast under the title of "Your RCA Foreign Correspondent" and features the slogan: "Today in war, tomorrow in peace, remember RCA Victor."

According to J. D. Cook, Vice President in charge of the RCAM International Division, the programs, in addition to making high-grade, unbiased news available, are intended to explain the RCA story to the public during a period of acute scarcity and shortages.

"There is nothing to sell," said Mr. Cook, "and these programs will explain why. The aim is to retain the good will of the Latin American public which has been built up for the past forty years."

The programs are adapted to the needs and conditions of each individual country through the local offices of both RCA Victor and the Associated Press.




## RCAM in Big Ad Drive

ONE OF THE LARGEST institutional advertising campaigns ever undertaken by the RCA Manufacturing Company opens this month with a series of 4-color, double-page ads in a sizeable list of the nation's leading mass circulation magazines. The campaign will run for one year, supported by spot-announcements on local radio stations from coast to coast, according to D. J. Finn, RCAM's Advertising Manager. Initial ads in the Saturday Evening Post, Collier's, Life, Time, Newsweek, and Farm Journal will show how RCAM's "Beat the Promise" campaign has proved a spark plug in war production.

## Sound Movies Aid War

RCA THEATRE and film recording equipments are playing important roles in the war, according to Edward C. Cahill, RCA Manufacturing Company's Motion Picture Division Manager. Sound motion pictures long ago won recognition by both civil and military authorities as a desirable recreational activity in maintaining morale and providing relaxation. Their use extends also into the fields of group education and training, Mr. Cahill said.

## War Programs Increase

BROADCAST TIME DEVOTED by NBC to programs intended to further the war effort continues to increase, according to figures released by NBC's Program Analysis department. During the period from July 16 to 31 inclusive, NBC broadcast 86 such commercial and sustaining shows for a total time of 29 hours and 49 minutes. This compares with 23 hours and 35 minutes allotted to the same objective in the first half of July.

# "CC"/ "MCC"/ "WCC"

By George Clark

Some old rusted coils of twisted wire, broken pieces of concrete, and a concrete slab that juts out over the eroded bank toward the ocean at South Wellfleet, Cape Cod, are all that remain of the first wireless station to be erected in the United States. Actually, in a sense, these relics are a monument to the audacity of Guglielmo Marconi, who dared to think that he might span the Atlantic with radio signals.

For the benefit of "old-timers," in whose memory the station is established forever, it should be recalled that at first, in the early 1900's, it was called "CC," changed to "MCC" in 1910, when all Marconi stations were given the prefix "M," and to "WCC" later on when international regulations required American stations to use the prefix "W" or "K."

In 1901, Marconi had two powerful radio transmitting and receiving stations erected, one at Poldhu, England, and the other at South Wellfleet. He also set up receiving equipment in Newfoundland, where, in the same year, he received the historic first signal (the letter "S") from across the ocean. A storm wrecked the first station at South Wellfleet, and it had to be rebuilt. It was formally opened on January 19, 1903. After years of service, it was dismantled by a force from the First Naval District in 1919.

MCC was especially noted for its dispatches of press every evening, the news of the day being prepared at the AP office in New York, wired to MCC, and thence "broadcast" by wireless. As the news came in on the Cape Cod wire it was punched on tape for automatic transmission, and then run through the reproducer at 10 p.m. at very slow speed. To any old-time operator or amateur who ever listened to that low-pitch, yet rich-sounding spark, the memory will never depart. But none of them will equal the thrill of the old lady on shipboard, who was privileged to listen in to the signal and who was told all about the modus operandi of the tape transmission. She said that she could understand all that very clearly, but what she could not see was how the paper tape could reach from shore to ship without getting wet!

Could she have seen the actual transmission she would have been even more enthused. At the relay in the transmitter room streams of fire a foot long were thrown off by the powerful air blowers. The spark could be heard through the air for several miles, and the light cast by it could be seen even as far as fifteen miles.

Cape Cod was a station for stern men. It was one of the outposts of civilization. So heavy were the blasts of sand blown up by the wind that it often brought blood to the operators' faces. The station was quite a distance from "civilization," and the men had to amuse themselves by the methods of the day. Eminent among these was the phonograph; anyone using profane language was fined in "records," and anyone going to Boston on leave had to bring back six records as "expiation." Nor was it without its dangers. The chef was struck by lightning in the kitchen, though not fatally, on one occasion, and his life thereafter was made miserable by the engineers who offered to give him a shock of 50,000 volts any time he wanted it.

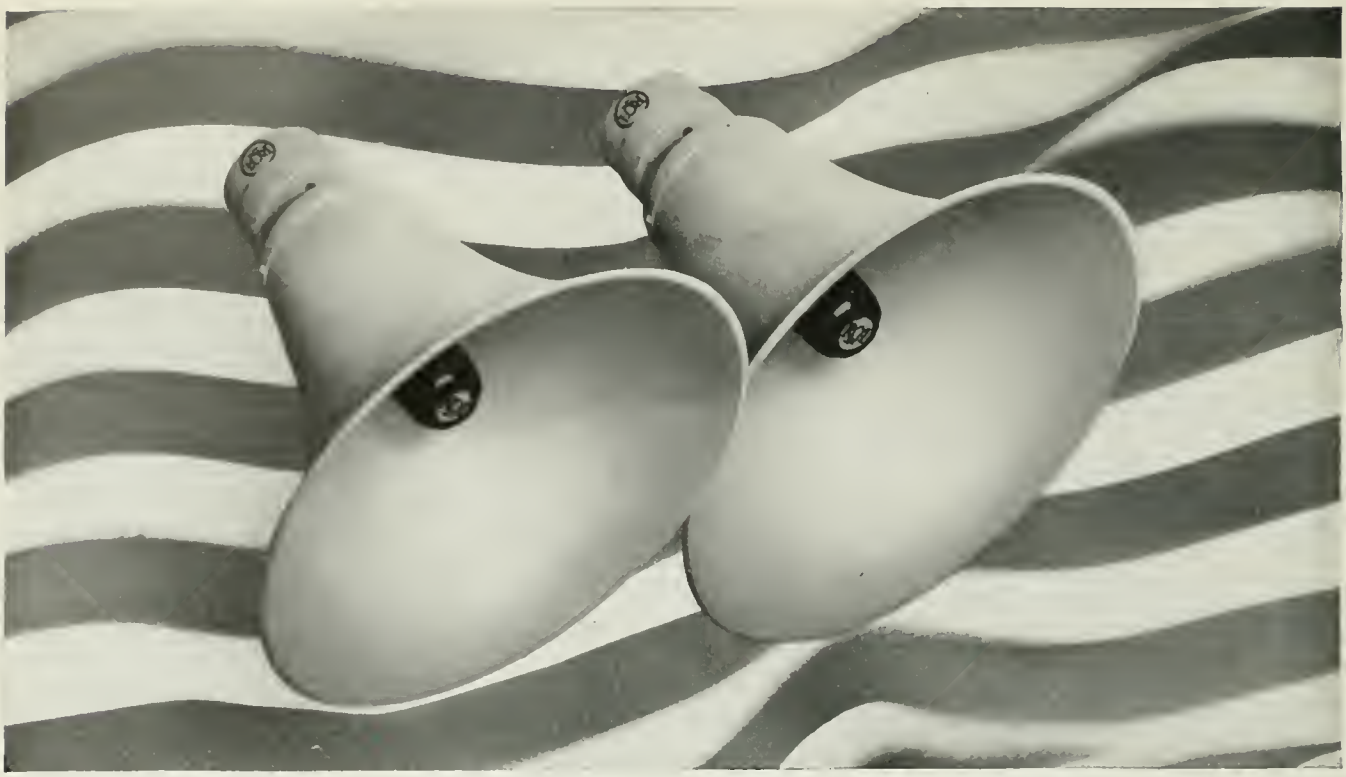


SOUTH WELLFLEET STATION IN 1904



RELIC OF SAME STATION IN 1942.

How RCA Victor's "Beat the Promise" Campaign Helps War Production



# SOUND...TO KEEP FREEDOM RINGING

TODAY, American industry has a new ally in sound—the sound of RCA Industrial Communications Systems.

Sound can reach men and women while they work. It stimulates their production, boosts their morale and spurs them on to greater effort.

In most RCA Victor plants, for example, war bulletins are broadcast. Music tides workers over "fatigue periods". Even the voices of former employees now in the service are broadcast to their friends at work in the plant.

An RCA Industrial Communications System has played a large part in RCA Victor's "Beat the Promise" Campaign ...a drive undertaken months before Pearl Harbor, by RCA Victor workers, to increase production of vital military radio equipment.

We have not used sound alone. Posters like those below—contests, suggestion-awards, rallies and printed messages—all played their part. Yet sound has played such an important part that hundreds of other companies have now installed RCA Industrial Communications Systems as essential producing tools!

This use of RCA Industrial Communications Systems—like the other elements of our "Beat the Promise" Campaign—grew out of a spirit we expressed in a statement published in September, 1941: "With RCA Victor, National Defense comes first. By comparison, we hold nothing else important."

RCA Victor invites from all firms now engaged in war production, inquiries concerning this system or any other part of the "Beat the Promise" Campaign. Address Dept. BTP-XA.

. . .

Lucy Monroe, RCA Victor's Director of Patriotic Music, is conducting song fests at various industrial plants. RCA Victor will make her available to all firms in war production as her schedule permits.

BUY U. S. WAR BONDS EVERY PAYDAY

## RCA VICTOR

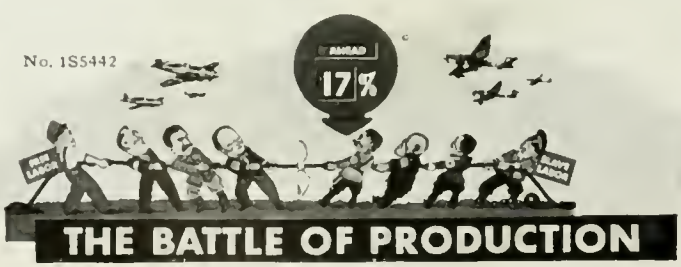
RCA Manufacturing Company, Inc., Camden, New Jersey

*A Service of the Radio Corporation of America*

No. 1S5588




No. 1S5442




No. 1S4591




Three of the many full-color production-stimulants prepared by employees of RCA Victor as part of the "Beat the Promise" Campaign—and available, at cost, to other manufacturers of military equipment. As this advertisement went to press, 90 companies had adopted, in whole or part, the "Beat the Promise" material. Posters shown measure approximately 20" x 27". The central piece is a display 42" long—the tug-of-war figures slide forward or backward to indicate the current status of production.




# Are you prospecting for "Pay Air"?

"Pay air" is the broadcaster's equivalent for the miner's "pay dirt." It means air that assays rich enough in listeners to make a radio program pay dividends to its sponsor.

You'll find most of the "pay air" over the 561 coast-to-coast counties that do 80% of the nation's retail buying. And it is no coincidence at all that the Blue Network delivers 86% coverage of those 561 counties.

Such concentration is one reason why the BLUE delivers your advertising message at the *lowest cost per family* of *any* medium . . . entering the home.

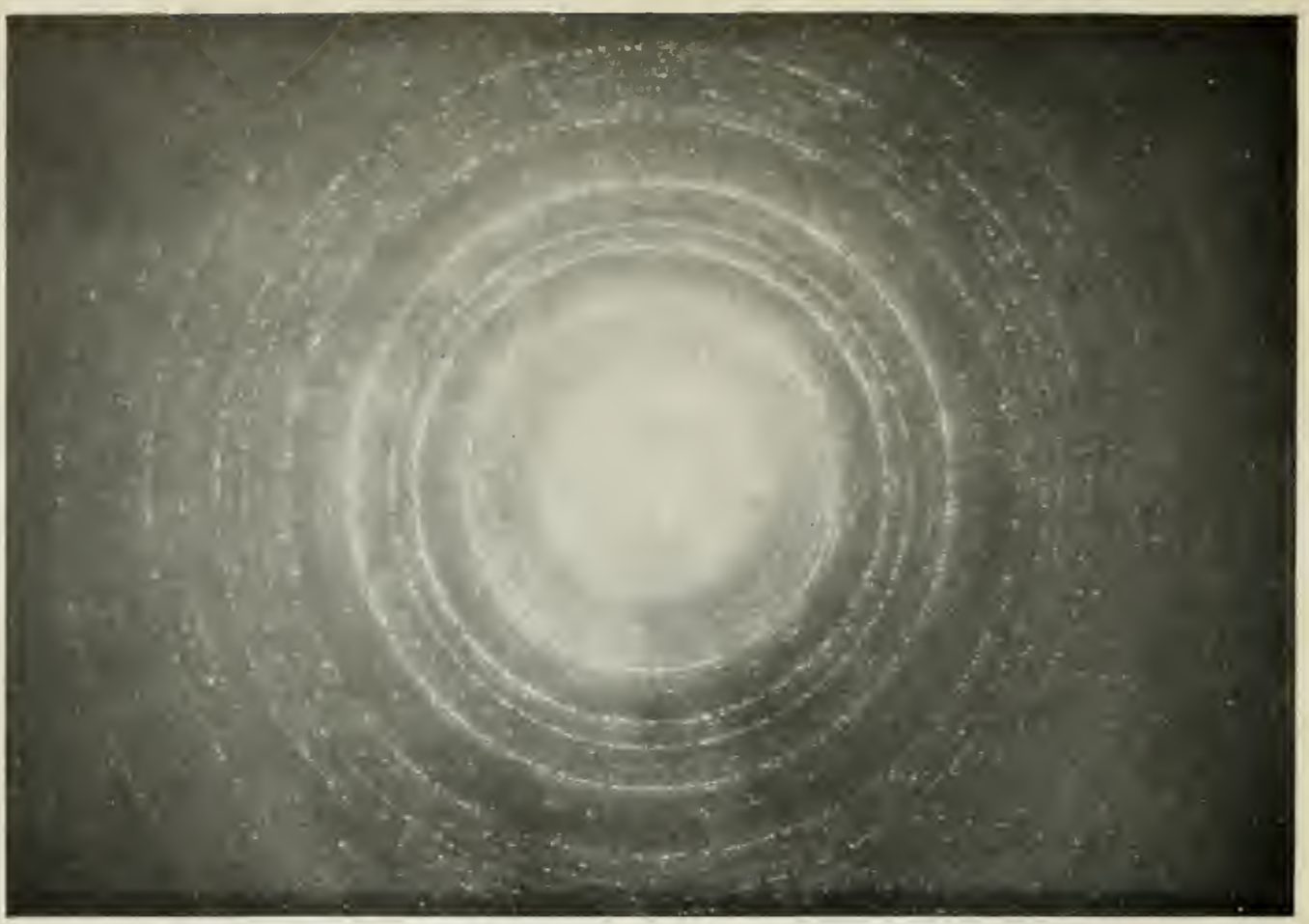
There are other reasons as well. They have to do with the BLUE's policy of competitive showmanship . . . and its radically new methods of audience promotion.

Your BLUE representative can give you the full story in a very few minutes. Why not call him in? The efficiency factors that have brought more new sponsors to the BLUE in '42 than to any other network may apply as well to *your* wartime advertising problem.

The Blue Network Company, A Radio Corporation of America Service




# the blue network



# A NEW ELECTRONIC SUN!

The famous RCA Electron Microscope has a new attachment—a diffraction camera, so that man's eye can see the enormously magnified structure of an infinitesimal object and actually determine its atomic design.

The *atoms* are not seen but the new adapter *finds out where they are*. The revealing picture looks like the midnight sun. But in reality this is not a picture of anything. It is the spirit of the crystal structure—an assembly of complex clues from which the mathematical detective can determine how the atoms take their orderly arrangements in various substances.

Scientists call the picture a diffraction pattern—a pattern from electrons, which found their way through the crystal lattice—that invisible, exquisite arrangement of atoms which nature fashions from humble table salt to the lordly diamond. It is a set of concentric circles, some diffuse, others sharp. From the dimensions of the circles and the intensities, the arrangement of the atoms in the material is determined, so that the crystal structure can be identified and analyzed.

Thus, RCA Laboratories open new and unseen worlds for exploration as the Electron Microscope coupled with the new diffraction camera sees deeply into electronic and submicroscopic realms.

BUY U. S. WAR BONDS EVERY PAYDAY!

## RCA LABORATORIES

PIONEER IN RADIO, ELECTRONICS, TELEVISION

A Service of the Radio Corporation of America • RCA Building, New York, N. Y.

*Other Services of RCA:* RCA Manufacturing Company, Inc. • National Broadcasting Company, Inc.
R. C. A. Communications, Inc. • Blue Network Company, Inc. • Radiomarine Corporation of America • RCA Institutes, Inc.

# RADIO AGE

RESEARCH · MANUFACTURING · COMMUNICATIONS · BROADCASTING



ANUARY

1943

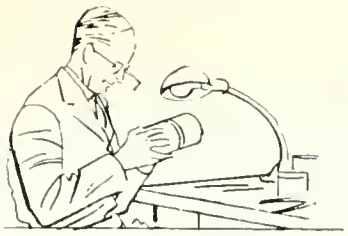


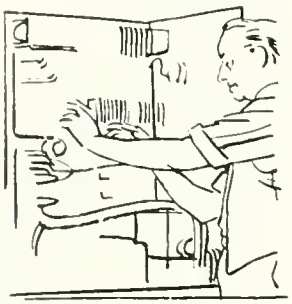

# ...IN THE CAUSE OF VICTORY

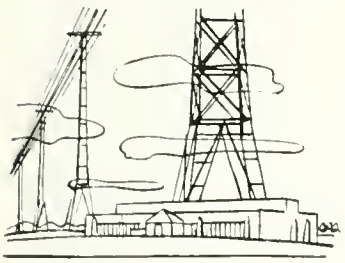
This is a war in which every minute counts. That's why NBC, in a recent typical month, devoted some 150 hours, an average of more than five hours a day, of its own time to realistic public service—keeping the nation informed of the progress of the war, mobilizing the nation's manpower, gearing civilian life to a war economy, aiding the sale of War Bonds, keeping the world informed of our war aims and effort, improving our international relations, furthering the cause of nutrition and health, etc., etc.

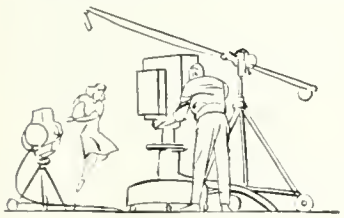
Every minute of this time has been devoted, directly or indirectly, to the cause of victory.

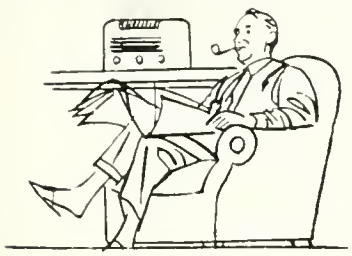
**This is the NATIONAL BROADCASTING COMPANY**











COVER — President Roosevelt hands Edwin C. Tracy the WPB's highest award, a Citation for Individual Production Merit, at the White House. Another RCA man, Stanley Crawford (left background) received a Certificate of Individual Production Merit.



# RADIO AGE

RESEARCH · MANUFACTURING · COMMUNICATIONS · BROADCASTING

VOLUME 2 NUMBER 2
JANUARY 1943

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THE SPIRIT OF WAR PRODUCTION IS SHOWN IN THIS PICTURE OF (LEFT TO RIGHT) E. H. PANCZNER, FACTORY SUPERINTENDENT; BRIG. GEN. C. R. HUEBNER, G. S. C., DIRECTOR OF TRAINING, S. O. S., AND NOWLAN TIMMON, WORKER, DURING A RECENT VISIT BRIG. GEN. HUEBNER MADE TO RCA VICTOR, INDIANAPOLIS.

# Sarnoff Lauds Radio's War Role

*RADIO PLAYED IMPORTANT PART IN TURNING TIDE OF VICTORY TO UNITED NATIONS; RCA PRESIDENT VIEWS SITUATION AS BRIGHTER, BUT WARNS AGAINST SLACKENING EFFORT.*



By Col. David Sarnoff

*President,*
*Radio Corporation of America*

NO YEAR in radio history has been so packed with activity in communication and scientific research as 1942. From research to manufacturing, from domestic broadcasting to world-wide communication, all radio has literally operated under one three-letter call W-A-R.

All the wonders and skills of yesterday and today in radio, are consolidated in the war effort for Victory tomorrow. The war situation is far brighter than a year ago, but we have a hard road ahead. In 1943, there must be no slackening in the all-out effort. We must guard against over-confidence until the war is won and peace is made secure.

New inventions and important developments which in normal times might require years to reach practical service, have been rushed to completion in months to meet the demands of war. The scientific achievements of radio in 1942 remain military secrets. When the service that radio has performed for the fighting arms of this country is made known after the war, Americans will be proud of the radio research workers and engineers, and of the production men and women, who have equipped the Army, Navy and Air Corps with apparatus unsurpassed in efficiency. Radio communication men will have dramatic and historic reports to make on their part in the war. Radio broadcasting, too, will have interesting facts to tell when Peace opens the microphone for wartime revelations.

In every branch of its activity, the art is far surpassing its historic achievements in World War I. In modern warfare the tide of battle flows to the side on which science, engineering and production are most strongly allied. Radio in 1942 played an important part in turning the tide of victory to the United Nations.

The press has published photographs of great ships being launched, massive tanks rolling down the production lines, fighter and bomber planes roaring aloft to combat, destroyers and submarines protecting great convoys and Commandos attacking an enemy-entrenched beach. These pictures reveal that the warring monsters maneuver with remarkable precision. But the pictures give little or no clue that radio is an important segment in the brain of these engines of war. An antenna is usually the only evidence that radio is aboard. Yet, it is radio which gives these armored monsters their ears and eyes, and even their sense of direction. The equipment they contain, and how it is used, remains a war secret within their iron hulks and hulls.

Radio gives eyes and ears to the Flying Fortress, to the under-sea craft, to the warship and to the mechanized infantry. The bomber can fly blind by radio, it can hear afar. In recognition of the plane's radio directional "instincts," broadcasting stations in enemy territory go off the air, falling like nine pins as it approaches, lest they serve as guides. The submarine has radio ears just as a fish has gills. To the warship, radio is indispensable in battle, in manoeuvring, and in tracking down the enemy.

### *Speeds Military Action*

Ashore, the infantry operates radio as a lifeline of communication. Even the advance units supplement their portable radio stations with self-contained pack stations popularly called "walkie-talkies." The achievements of the AEF North African invasion demonstrated the efficiency of the U. S. Signal Corps and Navy Communications—both operating in perfect harmony were described as "immensely vital to such fast moving and spectacular offensive." Naval communications won high commendation for the efficiency and dispatch with which it handled American vessels in the armada of 850 warships and transports that reached the African shores.

Radio coordinates and speeds modern military action; it is the one factor which has made blitz possible in warfare, and then made possible an effective defense against that blitz. Radio in itself is speed. It travels at the speed of light. Its wavelengths cannot be cut, bombed or blasted. A "walkie-talkie" can project a message into the air from underbrush, from a forest, or a hill

top. No power on earth can stop its winged flight.

These are only a few of the parts played by radio in this war, but they indicate the vital role of this great new art. Without it global warfare would have many a "lost battalion," "lost fleet," and "lost battlefield." Radio coordinates the combined effort and brings the long and scattered battlefronts into focus. Admiral Halsey, in the southwest Pacific, is no further away in communication, from headquarters in Washington, than General Eisenhower, in Africa. Admiral Nimitz and General Emmons, at Hawaii are in the same quick contact with Washington as the Army men in the Aleutians, Iceland or Panama. Radio puts them all on a direct and practically instantaneous line. War correspondents have reported how the American army erected a powerful radio transmitter during the landing operations in Africa, first to calm the local population and enlist aid of the natives.

These illustrations of radio activity in the war may convey some idea of the scope of the work that has been in progress in the manufacturing plants and on the wavelengths during the past year. To equip every bomber, ship, motorized unit and field base with radio has been a herculean task. The American radio industry, which in peacetime produced millions of radio sets and hundreds of millions of radio tubes, has met the challenge superbly, as evidenced by the Army-Navy "E" flags flying over many radio factories.

Radio has been put on the many fighting fronts by the production workers. Throughout the year they have toiled day and night to equip the United Nations with the finest radio apparatus in the world. Radio manpower, working hours, production methods and communication were geared every day of 1942 to the winning of the war. Production of civilian radios ended in the Spring of '42. As early as 1939, following outbreak of the war in Europe, the RCA Victor Division had begun conversion from a commercial basis to war production.

The use of radio in the war and of radio-electronic devices in the war-effort of industry, to speed production and increase efficiency, has brought new recognition to the word electronics, which was born of radio.

For years, the radio industry has manufactured more than 100,000,000 electronic tubes annually. Radio tubes which produce electrons, control them and harness them to service in communication and industry, have become the heart of electronics. These tubes have paved the way for major advance in the radio art for the past two decades, including broadcasting, short-waves and television. Tubes opened the micro-wave spectrum which borders on the frontier of light. In the electron microscope, they have even passed beyond this frontier, to utilize the electrons as "light beams" infinitely smaller than the rays of light themselves.

Television, operated by NBC in New York, has played an important role in air raid instructions and civilian defense. Its laboratory status is a war secret, but those confident of the success that marks wartime developments, expect television to emerge from this war in such form as to make possible a great post-war industry.

Television, however, is not radio's only post-war promise. The useful services of radio will be broadened far beyond the communication field, into such realms as the RCA Electron Microscope, radio frequency heating, supersonics and no end of applications made possible by the development of new radio tubes, especially those designed to send and receive micro-waves — tiny waves measured in centimeters.

The application of radio frequency heating to speed industrial processes and at the same time increase their efficiency, is rapidly coming to the fore. Radio waves may now be used to heat, dry, glue, stitch, anneal, weld, rivet and even to deactivate enzymes. This new field is known as radiothermics. It can laminate an airplane propeller in minutes compared to hours re-

## RCA VICTOR DIVISION

*Unification of RCA With Its Manufacturing Subsidiary Coordinates Operations and Aids War Effort.*

THE RCA Manufacturing Company, wholly-owned subsidiary of Radio Corporation of America, was consolidated with the parent company, effective December 31, 1942, David Sarnoff, RCA President, announced December 29 following a special meeting of the RCA Board of Directors.

The manufacturing organization, with its more than 30,000 employees, will be known as the RCA Victor Division of Radio Corporation of America. The management, personnel, operations and sales policies will continue as heretofore.

"The unification of the administrative, research and manufacturing activities of RCA will result in closer coordination and increased flexibility of operation," Mr. Sarnoff stated. "It is expected that this unity and coordination of services will facilitate the company's war effort."

Mr. Sarnoff also announced that at the meeting of the Board, George K. Throckmorton, former Chairman of the Executive Committee of the RCA Manufacturing Company, was elected a Vice President of the Radio Corporation of America, of which Mr. Throckmorton is a Director.

The principal plants of the RCA Victor Division are located in Camden and Harrison, N. J., Indianapolis, and Bloomington, Indiana, Lancaster, Pa., and Hollywood, Cal. The RCA Laboratories are located at Princeton, N. J.

quired by ordinary heat and pressure methods. Radio high frequency "furnaces" are a post-war prospect. In them railroad ties will be seasoned quickly and "cakes" of textiles dried uniformly. Even rubber may be "radio-cemented" to wood or plastic; cloth stitched and seamed by radio heat; metals hardened; plywood glued and fresh vegetables deactivated without loss of flavor or color. The possibilities in this new thermic realm of radio are unlimited as indicated by remarkable advances in RCA Laboratories during the year.

Radio broadcasting in 1942 distinguished itself in many fields of useful service. From hour to hour it carried to every listener, the running story of the war. It has kept America informed.

The long distance voices in London or Cairo, Moscow or Melbourne, Algiers or Calcutta, have been as clear as if uttered in Radio City, New York. Radio reporting is one of the outstanding contributions of science in keeping the American people in contact with their allies overseas.

At home, broadcasting in 1942 vastly increased its program services. Thousands of announcements were broadcast urging war bond purchases or telling the public about the special needs of the Army, Navy, Marines, Air Corps, Red Cross, USO, the WPB, OPA and similar agencies. In addition, hundreds of entertainment and news

*(continued on page 29)*

(Official U. S. Navy Photo.)





## '43 TO SEE INDUSTRIAL POWER IN FULL FORCE

*Harbord Says Nation's Production Will Eventually Overwhelm the Enemy.*

By Lieut. Gen. James G. Harbord

*Chairman of the Board, Radio Corporation of America*

THE United Nations should look forward to 1943 as a year bright with promise in the war against the Axis. Here in the United States, after long, hard months of preparation, we are getting results scarcely believed possible a year ago. Millions of men are being equipped and trained in modern warfare. Our industrial capacity has been geared to a speed that will eventually overwhelm the enemy with its weight and power. With all its implications for final victory, this power should come into full force during 1943.

Real fighting is ahead. Wherever the battle lines are drawn, radio will be in the thick of the fight, for it is the lifeline of wartime communications on land, sea and in the air.

The war map today reveals that American soldiers, sailors and marines are lined up at more than sixty places on the world-wide fighting front. To unify them in communications is a mighty task. Without radio it would be a slow, almost impossible task. Every outpost, whether in jungles or on glaciers, no matter how remote, is linked to headquarters. American fighting men, almost a million of them, are focused in action by radio—the global lifeline of communications.

In World War I, the center of action lay in France. From that battlefront radiated the communication lines. Wireless was being given its first wartime test, but at no time did the demands upon it remotely approach those of World War II. In the intervening years, the development of the electron tube, of short waves, and of many other devices and services of radio have tremendously increased the efficiency of communications. The result has been that in 1942, radio was ready to play the vital role assigned to it on the many far-flung fronts.

These long-distance fighting fronts are bulwarked by the home front. In this war the military front and the home front are parallel. The home front is the production front and it runs through every street in the nation. Munitions and food, airplanes and tanks, rifles and radio, all move up to the front lines from the home front. Today, eighteen Americans stand behind every American fighting man. His success and the winning of this war depend upon the workers at home, for only one American in every nineteen will have a job directly in the combat forces in this war.

The road ahead to winning this war is rough. Every mile toward victory must be fought for with an all-out effort. The rapidity of the march, the turn in the tide of battle, hinge upon science and production, as well as upon direct combat with the enemy.

*(continued on page 25)*

RADIO OPERATOR IN NAVY PATROL BLIMP ON ANTI-SUBMARINE SCOUTING DUTY.

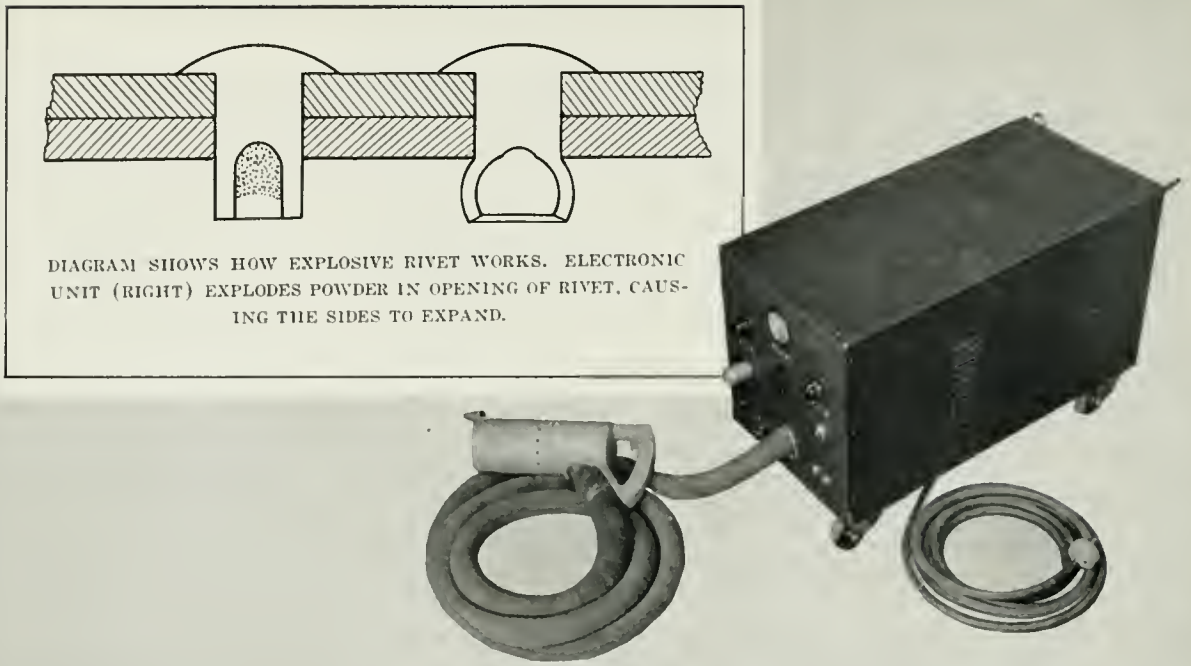


DIAGRAM SHOWS HOW EXPLOSIVE RIVET WORKS. ELECTRONIC UNIT (RIGHT) EXPLODES POWDER IN OPENING OF RIVET, CAUSING THE SIDES TO EXPAND.

# Radiothermics Speeds Industry

*NEW FIELD OF INDUSTRIAL SCIENCE APPLIES RADIO FREQUENCIES TO SHORTEN PRODUCTION CYCLES; APPLICATION OF RADIO HEATING IMPROVES PRODUCTS AND SPEEDS PROCESSES.*

By I. R. Baker
*RCA Victor Division,*
*Radio Corporation of America*

SINCE radio first attracted the attention of the world as a radically new system of signaling, its services have been broadening. From the dots and dashes of wireless evolved the radiophone and worldwide broadcasting. Research which developed such magic keys to progress as the radio tube, continues to open new horizons, some of them far afield of communications.

The first transatlantic signal in 1901 inspired many bold predictions among scientists — perhaps some day wireless would transmit the human voice, maybe it would carry pictures. To the average person those were fantastic dreams. It was difficult enough to believe that messages could flash through space at the speed of sunlight. Certainly no Jules Verne appeared in the halycon days of Marconi to predict that radio waves might be used to heat, glue, dry, case harden, anneal, rivet, weld and even deactivate enzymes!

All this and more too has come to pass through the development of man's mastery over tiny radio waves — high frequency currents, which open a wide new field of usefulness—radiothermics.

We normally think of radio frequency transmitters as a means of making possible communication and entertainment. Today, high radio frequencies are being used to shorten production cycles, improve products and accomplish manufacturing processes which were previously impractical. Tomorrow, with additional development and higher frequencies, will come numerous new applications.

This new industry has grown rapidly since the start of the war and radiothermic equipment will be used extensively by the end of 1943. As a matter of fact, it is estimated that by that time more radio frequency power will find use in industry than the total installed power of all the broadcasting stations (approximately 3,712,000 watts) in this country.

When the first tubes and circuits

were developed, little did the experimenters realize the full significance of their findings and the possibilities of the radio industry. Likewise, we cannot predict today the future radio frequency applications in industry.

The research and development engineers of RCA have been working on applications of radiothermic principles for use in defense projects.

The principle of generating heat by radiothermic means is not new. The two fundamental ways in which this can be accomplished are dielectric heating and induction heating.

Non-conducting materials are best heated dielectrically. In this case the heat is generated from dielectric losses in an electrostatic field. Most people are familiar with the diathermy machines which are widely used in hospitals, clinics and by physicians. These radio-frequency machines generate heat deep within the body tissues because of dielectric losses. The same principle is now being used in industry in various manufacturing processes. Wood, paper, cloth, and various compositions are examples of material that can be heated in this manner.

One of the most important applications of this method is the manufacture of wooden aircraft parts such as propellers, spars, ribs, wing structures, etc., of laminated plywood. Laminated wooden propellers and parts are being widely used as a substitute for metal. Since radio frequency generates the heat uniformly within the part, the time required to bring the wood up to temperature is dependent only on the power used and not on the flow of heat from an external source.

The use of plywood for airplanes is, of course, not new. Plywood airplanes were used in 1925. All plywood had at that time limitations imposed upon it by the animal and vegetable glues then available. Moisture, age, temperature, and fungi growths weakened the glues and, in addition, plywood was a considerable fire hazard. Because of these difficulties, aluminum replaced plywood. It was not until the development of synthetic resin glues in 1935 that plywood became a practical material. Almost all of the objections were removed by the new synthetic resin glues. These glues are fire-resistant, fungi-proof and practically water-proof. The bond is stronger than that of the wood itself.

Two different types of synthetic glues are available at present—the cold-setting urea formaldehyde type and the thermo-setting phenol formaldehyde type. Since rather high setting temperatures are required to properly process most phenol types (250° to 300° F) and from four to six hours in time is required for setting the urea type without heat, the advantage of radio frequency as a source of generating heat for bringing these glues up to temperature is obvious.

### *Use Saves Time, Labor*

A lengthy period is required in the manufacture of laminated airplane propellers for the heat to penetrate when applied with the conventional steam-plate type press. Also, the outer surface heats faster than the center portions, which may set up residual stresses that affect the strength of the finished piece. Radio frequency provides a means of uniformly applying heat throughout and at a much more rapid rate than can be obtained with hot plates. The processing time, when radio frequency is used, becomes minutes instead of hours.

In producing other thick laminated "compreg" (impregnated and compressed) structures of wood, canvas, paper, etc., by ordinary processes, the time is exceptionally long, sometimes as long as twenty-four hours. With radio frequency the time for heating can be reduced to approximately 30 to 60 minutes. This means not only a material saving in labor but also in press facilities. Where molding processes of the same materials are involved, this also saves duplicating expensive presses and dies to secure additional production.

In addition to the application of radio frequency power to the wood industry and other laminated materials, it is equally applicable to the plastic industry. Savings of from 15 to 1 in time and even more can be obtained by use of radio frequency. The ratio of time saving depends upon the thickness of the part.

In the fabrication of molded aircraft parts which are built up of thick wooden laminations, each layer of these laminations is tacked on the mold by small staples. As the successive layers are put in place, it is necessary that the staples be removed from the preceding layer. This is a tedious and lengthy process. A simpler and quicker method was devised by our engineers which eliminates the use of staples entirely. This method makes use of an oscillator, together with an applicator called the "gun." The glue that is used in these operations is generally a thermo-setting resin which requires heat to set. As this glue heats and before final polymerization takes place, the glue becomes "tacky." Therefore, if heat is applied locally to a small spot, a bond is formed sufficient to hold the laminations temporarily until the whole

METHOD OF GLUING AIRPLANE SPARS WITH RADIO FREQUENCY SHOWN IN THIS SCENE FROM THE TOLERTON LUMBER COMPANY, ALLIANCE, OHIO.



structure can be heated and the glue set.

Materials that are good conductors, such as metals, can be heated readily by radio frequency. When current flows in these materials, heat is generated by eddy currents and hysteresis loss. Thus by holding a piece of metal in the field of the coil, power is absorbed and the material heats rapidly. This type of heating is generally referred to as the inductive method. Case hardening, soldering, brazing, melting and other operations are accomplished readily by this method. The time required for a given soldering operation is greatly reduced since heat is actually induced in the part instead of being transferred from a hot iron or a gas flame. Individual soldering operations on terminals in transformer cans need not be done. By placing rings of solder under the terminals and placing the coil properly, soldering of all the terminals becomes a matter of seconds. Brazing operations can also be accomplished by inductive heating. The coil is shaped to the area to be treated and the power is applied. The rate of temperature rise can be controlled quite accurately by the power used. The temperature can be brought up instantaneously or slowly, as desired.

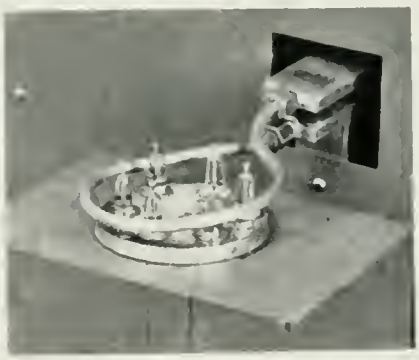
Most of us are familiar with the usual method of riveting, where one man drives the rivet while another man holds a tool against the end to flare it. This method has been used since the riveting process was developed. It is satisfactory except in confined spaces where it is difficult to reach the other end of the rivet. One aircraft company even resorted to employment of midgets to work in confined spaces. Even so, wing tips and other places present difficult problems. A skilled workman could rivet perhaps only one or two of the old-fashioned rivets in a minute simply because his helper could not manipulate the tools fast enough.

The du Pont Company developed an ingenious explosive rivet which did not require a helper to get at the other end. This rivet has a heat-sensitive explosive charge in one end. When the charge is fired, it expands the end of the rivet, forming a perfect, barrel-shaped



ELECTRONIC UNIT FOR SPOT GLUING, USING RADIO FREQUENCY.

head that holds the two pieces of material firmly together. The advantage of using this rivet in inaccessible places is obvious. Almost anyone today can set 15 to 20 explosive rivets in a minute as compared to the one or two by the old method.



ELECTRONIC METHOD OF SOLDERING TERMINALS ON TRANSFORMER CANS.

One method of firing explosive rivets is by means of a riveting iron which was developed specifically for this purpose. It is similar in construction to a soldering iron and has a silver alloy tip which conducts the heat to the rivet head. This rivet firing tool has the disadvantage that considerable time is required either to attain operating temperature or in changing from one tip temperature to another.

In order to find a more satisfactory solution for firing the rivets, particularly in large scale production, RCA engineers, in cooperation with du Pont engineers, developed a radio-frequency rivet detonator. This unit consists of an oscillator together with a specially developed applicator to concentrate the current directly into the rivet head. As the current is induced into the rivet head, the rivet heats very rapidly and this heat fires the charge. This method has a number of advantages. Most important of all, better temperature control is obtained, since the power output control of the oscillator can be quickly changed to suit the requirements of the various sizes of rivets. A number of rivets can be put in place ahead of the riveter and held in place by scotch tape, since this tape does not interfere with the action of the radio frequency device.

The above are only a few of the possible applications. The solution of one problem always suggests the solution to another. Radiothermics is truly a time saver for industry. Short production cycles are always important, but never so important as today when material is so badly needed by the United Nations. RCA is also serving by helping others save precious hours.

"News for Mexico," a daily series of ten-minute Spanish newscasts provided for the exclusive use of station XEW and its 41 affiliated stations in Mexico, is being transmitted daily over RCA Communications, Inc., facilities. The Mexican outlets are affiliated with NBC's Pan American network.

PLYWOOD CLUB USED FOR TESTING AIRPLANE MOTORS IS SHOWN UNDER RADIO FREQUENCY HEAT TREATMENT.






THE ARMY-NAVY "E" FLAG IS PRESENTED TO RADIOMARINE CORPORATION OF AMERICA. LEFT TO RIGHT—I. F. BYRNES, CHIEF ENGINEER, AND H. A. SAUL, PRODUCTION SUPERINTENDENT, RECEIVE PENNANT FROM BRIG. GEN. RALPH K. ROBERTSON AND REAR ADMIRAL WILLIAM C. WATTS (RET.).

# Radiomarine Wins Army-Navy "E"

*PRODUCTION AWARD FOR ACHIEVEMENT IN MANUFACTURING RADIO EQUIPMENT FOR WAR PRESENTED BY REAR ADMIRAL WATTS AND BRIGADIER GENERAL ROBERTSON; EMPLOYEES ARE GIVEN LAPEL PINS.*

THE Army-Navy Production Award for achievement in manufacturing radio equipment for war was presented to Radiomarine Corporation of America by Rear Admiral William C. Watts, U. S. Navy (Ret.), and Brig. Gen. Ralph K. Robertson, Commanding General, Metropolitan Military District, in a ceremony December 19 at the company's New York general offices and plant. Lieut. John D. Lodge, U. S. Navy Reserve, acted as chairman of the program.

Several hundred employees of Radiomarine, whose work had been praised in a letter from Under Secretary of the Navy James Forrestal as a "remarkable production record" and as "helping our country along the road to victory," participated in the event. The Army-Navy "E" flag was raised, and each worker was presented with a lapel "E" pin "symbolic of leadership on the production front."

"When a company, in time of war," Rear Admiral Watts said, in presenting the "E" pennant, "is engaged in the production and installation aboard ship of marine radio equipment of all kinds and various automatic alarms and safety devices, everyone knows, without a word of explanation, that that company is doing just about as vital war work as any industry in the country.

"When, furthermore, that company so performs its allotted tasks in the great, national war effort as to earn the government's highest



BRIG. GEN. ROBERTSON DECORATES MRS. E. P. SCHNABEL, GENERAL OFFICE, WITH "E" LAPEL PIN SYMBOLIC OF THE ARMY-NAVY AWARD. ALL EMPLOYEES OF RADIOMARINE RECEIVED THE PINS.

tribute to any industry, the Army-Navy Production Award, it is proof positive that it has been doing a thoroughly fine job. It goes without saying that it is *your* company which I have in mind, and as I am sure you realize all this, I will not take your valuable time to describe your many fine achievements or to emphasize the absolutely essential part that radio communications take in modern war."

Pointing out that the operations of Radiomarine are "widely scattered over all our country, in some sixteen centers of activity," Rear Admiral Watts said he was glad that all employees received the insignia of the award, the Army-Navy "E" pin, "for we want every member of the far-flung Radiomarine Corporation to realize our gratitude to him or to her."

Brigadier General Robertson made the presentation of the "E" insignia for individual employees.

"Today our nation faces grave peril," General Robertson said. "We are engaged in a life and death struggle to determine whether freedom or tyranny shall survive. For us there can be but one answer—WE SHALL WIN!

"Our men are fighting on many fronts. Their skill and courage are unquestioned. But those attributes alone are not sufficient. With the grim determination to win, we must have armament and equipment for our forces.

"It is unnecessary to recite the kind of material you are producing requiring skill, accuracy and precision. But sometimes you may feel that your work is not important or that what you are doing is all mixed up with human selfishness and greed. You may feel that no one cares whether you produce or not. When you feel like that, take a look at this Army-Navy production pennant about to be hoisted over your plant, knowing full well for what it stands.

"When you wear the Army-Navy emblem, with its silver "E" for excellence, wear it with a feeling of pride. In a way, it is a military decoration, bestowed upon you for devotion to duty. It is an award for faithful service, as truly as if you were on the fighting line instead of the production line. Wear it with dignity. Remember that 'free labor' will win this war, and that you are fortunate to be free Americans."

Charles J. Pannill, president of Radiomarine, stated to the employees:

"The decision of the Army and Navy to reward our Corporation for excellent war production by presenting the 'E' pennant and suitable pins to our employees is an honor for which you should be justly proud. The continuance of your effort to help produce the communication requirements of the military forces is extremely important. Armies cannot move nor can ships sail without efficient communication apparatus. . . . I am counting on all of you, throughout our service, no matter where you are located. I am confident you will not fail."

I. F. Byrnes, chief engineer, and H. A. Saul, production superintendent, of Radiomarine, accepted the pennant on behalf of the company. In a brief acknowledgment, Mr. Saul said:

"It is indeed a high honor to receive such recognition from the military services as the award of the Army-Navy 'E' pennant. We are very glad to do our part in the production of necessary radio apparatus for your respective services, and we shall continue to bend all our efforts to do the job promptly and efficiently. We still have a long way to go to complete our commission, but you need not feel any anxiety about the employees of this very loyal and patriotic family falling down on the job.

*(continued on page 31)*

REAR ADMIRAL WATTS CONGRATULATES CHARLES J. PANNILL, PRESIDENT OF RADIOMARINE.






NBC MICROPHONES GO INTO THE FIELD ON A MILITARY PROBLEM WITH MEN FROM FORT BRAGG, N. C., TO PICK UP A BROADCAST FOR "THE ARMY HOUR."

# Army Takes the Air

## "THE ARMY HOUR" ON NBC, "NOT A RADIO PROGRAM, BUT A MILITARY OPERATION," SECRETARY STIMSON SAYS.



By William Burke Miller

*Manager, Public Service Department, and War Program Manager, National Broadcasting Co.*

WHEN the United States discovered its security was endangered, it set out to defend itself against its enemies with the best of its resources.

When it needed an army it drafted the cream of its manpower. When it needed airplanes and jeeps, it put the nation's best designers and engineers to work. When it undertook a military operation, it called upon the best tacticians and strategists. It called upon the men with the best "know how."

And when, some months after Pearl Harbor, the United States decided to produce an official radio program, it came to the National Broadcasting Company.

The plans were ambitious. What was wanted was no mean program about camp life, no melodramatic fanfare, no gags about soldiers:—but instead, a well-done, well-built program; a program truly representative of Uncle Sam's vast army in all its various phases; a program with sufficient dignity to represent the U. S. Army; a program that would explain the Army; a program that would demonstrate truthfully to the nation what its sons and brothers and fathers were doing, whether they were in a Texas training school or a desert outpost.

That was the job NBC had to do. It was not an easy one. Production directors, special events and program experts, musicians, and engineers conferred. The time, the length, the format, the content had to be worked out. The result was "The Army Hour."

The first program was aired on April 5, 1942—the twenty-fifth anniversary of the entrance of the United States into the first World War. The initial "Army Hour" speaker was Secretary of War Henry L. Stimson, who proclaimed it "not a radio program, but a military operation of the United States."

"It is a weapon of war, and it is being heard and felt all over the world," said Secretary Stimson, "by you at home, by you on our remotest battle lines; by you, our enemies, wherever you may be. This is the Army Hour: let it be a potent weapon."

With that auspicious inauguration "The Army Hour" was on its way. Today the record of the nine-month old program is no less noteworthy than its beginning.

Outstanding feature of the hour-long Sunday program is its elaborate use of remote broadcasts. Wherever the soldiers of the United States, or its allies are to be found, there go NBC microphones. Thousands of miles are spanned in a single program, bringing messages from high-ranking officers and Private John Doe in every corner of the world.

"The Army Hour" has gone overseas for more than sixty "pickups"; to Chungking, to Panama, to New Delhi, Honolulu, Curacao, Cairo, London, Leopoldville, Moscow, Melbourne, Puerto Rico, Montreal and Algiers, broadcasting messages from the boys, speeches by generals, and actual reports from battlefronts.

Despite that frequent globe-hopping, "The Army Hour" has an amazing record. Only three remote broadcasts have failed to come through, although NBC producers



THE "CONTROL ROOM" OF A REMOTE BROADCAST ON "THE ARMY HOUR," DURING ONE OF THE MANY DOMESTIC PICKUPS OF THE PROGRAM. WYLLIS COOPER, AUTHOR OF THE PROGRAM, STANDS AT THE TABLE.

love to talk of what "might have been".

Broadcasts from New Delhi have been their biggest headache. One week they looked forward to carrying a talk by Gen. Archibald P. Wavell, which would have been his first broadcast to this country. But reception conditions went bad.

Another time, arrangements were made to interview a British flier who had crashed within ten minutes flying time of New Delhi and spent thirty days getting through the jungle. Another swell broadcast that didn't come through!

The third pick-up that didn't, was scheduled for a Russian airport, and would have been the first Russian outdoors broadcast. Reception was fine up until two minutes after the broadcast began. Then a foreign station accidentally put an unscheduled program on the NBC channel, marking the end of those fine plans.

NBC production directors still dream of those plans that went awry. They don't talk about the fifty that did come through like clockwork, because America has heard them, and they're water under the bridge.

In the domestic scene, "The Army Hour" has maintained just as vigorous a program of remote broadcasts. It's an extremely obscure point that an NBC microphone hasn't visited on an Army Hour pickup. In its nine months of broadcasting, the hour-long program has aired more than 100 remote broadcasts in this country, visiting army camps, training schools, depots, air fields, war plants, and maneuver areas. From Camp Edwards, Mass., to Camp San Luis Obispo, Cal.; and from Aberdeen Proving Grounds to Lowry Field, Col., "The Army Hour" has brought listening America a vivid picture of the Army in action, whether it was introducing V-Mail, or taking NBC listeners to a West Coast plane factory.

Here again, operating under the most difficult broadcasting conditions, NBC has given "The Army Hour" an amazing record of few failures. There have been a handful of near-misses on domestic pickups, but only one actual failure.

For one broadcast an NBC announcer turned up at a New England war plant an hour before the broadcast, and, with sinking heart, found only a night watchman behind locked gates. He called the studio, and hasty plans were made to fill the time in the NBC studios. But the war workers arrived ten minutes before the broadcast and the program went on as scheduled.

The one failure that did occur was a heart-breaking affair. A broadcast from deep in the heart of Texas was scheduled to bring an eye-witness account of the Third Army blowing up a 240-foot steel bridge to demonstrate demolition tactics. Immediately after the demolition of the bridge WPB workers were going to move in and remove the steel for scrap. It was a swell idea. In the NBC control rooms, with other portions of the program on the air, tests from Texas came through well. The announcer took his cue: "Go ahead Third Army in Texas." Nothing happened. The phone lines had gone bad fifteen seconds before air time!

Less hectic, but equally dramatic, is "The Army Hour's" presentation of high-ranking army officers. More than 90 important officers have been heard, half of that number generals. The roster of the nation's military leaders who have appeared on the program includes Lieut. Gen. Lesley A. McNair, commanding general of the American Ground Forces; Brig. Gen. H. L. George, of the American Air Forces Ferrying Command; Maj. Gen. L. E. Brereton, American Air Forces in India; Brig. Gen. James Doolittle; Brig. Gen. William C. Lee, commanding general of the Air Borne Command; and countless others.

High-ranking officials of the United Nations have also voiced "Army Hour" messages. Among them are Field Marshal Sir Archibald Wavell of Britain, Maj. Gen. of Aviation N. Sokoloff-Sokoliensk of Russia, and Generalissimo and Madame Chiang Kai-shek of China.

A dramatic incident was the recent broadcasting of a message from Yugoslav General Drago Mikhailovitch. The message was got out of Nazi-occupied Yugoslavia by secret methods and read by George Putnam, NBC announcer, in New York.

Other noted persons to appear on the program, in addition to Secretary Stimson, include Undersecretary of War Robert Patterson, Secretary of Agriculture Claude Wickard; Col. David Sarnoff; Mrs. E. V. "Eddie" Rickenbacker; and Sergeant Joe Louis, to name just a few.

As "The Army Hour" grew in importance to the American public, listeners began to turn to the program for official war news. NBC producers were quick to recognize this need, and recently asked the Army to include an official war report each week. Col. R. Ernest Dupuy, Chief of the News Division of the Bureau of Public Relations, War Department, now reports each week from Washington. It is the only official "communique" regularly announced by an officer of the General Staff Corps.

With the Army of 1942 so vastly different from the Army of 1917, "The Army Hour" found itself with a reporting job to do—a job of acquainting the nation with its new armed forces, and their new weapons.

The problem of demonstrating the new army and its new weapons was a difficult one. But the Army offered its fullest cooperation, with certain wartime restrictions, and NBC offered its corps of experts for the problem of broadcasting loud-voiced cannons, thunderous flying fortresses, and chattering machine guns.

The program has done a comprehensive job, demonstrating more than fifty different weapons — "weapon" meaning anything from an echelon of pursuit planes to a new automatic pistol. From planes whizzing through the air, from bomb turrets using new sights, from monstrous tanks rumbling across the fields, and from rifle ranges, "The Army Hour" has shown the nation what its soldiers are using in the field of battle,— what their war bond money is buying.

But despite the record of the program to date, it hasn't been all milk and honey. "The Army Hour" works under handicaps that probably have been faced by no other program in the history of radio— this despite the all-out cooperation of the Army and NBC.

The first obstacle is the inherent difficulty of handling a program that encompasses the world in scope, and has as its substance millions of soldiers and war workers. It was that inherent difficulty that made the cynics scoff when the program was first undertaken. Yet strangely enough, that is the least troublesome problem. Although it does remain a problem it is one with which "The Army Hour" is successfully coping. With NBC's expert knowledge of bringing in reports from every corner of the globe, vast distances have shrunk to insignificance, and with a horde of producers, writers and engineers scattered across the country—handling the large number of soldiers and machines is now almost a matter of routine.

Now, as the U. S. Army seizes the offensive, the "Army Hour" has a major problem in the time element. When American forces landed in North Africa, the "Army Hour" had to remake the program on last-minute notice.

Similar last-minute news reporting took place when Capt. Eddie Rickenbacker was rescued at sea. The dramatic story of his rescue was flashed to the world on the morning of Saturday, November 14. The following day "The Army Hour" presented a stirring message from Mrs. Rickenbacker.

Today "The Army Hour" is accustomed to last-minute revamping of scripts, and plans to keep pace with the war news.

One problem that presents an outstanding bugaboo is censorship. A program that is as close to the armed forces as is "The Army Hour," stands in constant danger of revealing vital information. It is no slight tribute to the producers of "The Army Hour" that with hundreds of broadcasts from war plants and army camps, nothing of value to the enemy has been revealed, although sufficient information has been broadcast to be of dramatic interest to American listeners.

But it hasn't always been easy. For instance, a certain important airport is beset with bad weather conditions. (Wouldn't the Japs like to know which one?) "The Army Hour" went out to that airport to demonstrate a new pursuit plane. The weather at the start of the broadcast was fine. The planes took off and the NBC announcer—Joy Storm—prepared to describe them as they came in for a landing. Sud-



BILL STERN, NBC ANNOUNCER, TALKS ON "THE ARMY HOUR" FROM A PLANE.

denly the weather went bad. (Was it fog or rain or snow, Hirohito?) and the announcer found himself with nothing to describe because the planes had lost the field. But he described it anyway, pretending the planes were merely out of earshot. For fifteen minutes that announcer ad-libbed and never once did he give any inkling of what was wrong. In fact, the NBC engineers and producers in Radio City never suspected themselves what was happening.

That was just one of "The Army Hour" headaches,—and there are a lot of them.

Second major problem is wartime conditions. While the Army extends the fullest cooperation, it is still a wartime Army, and "Army Hour" producers never know when an emergency alert will send a squadron of planes, (and the broadcast) "scrambling".

The technical side of "The Army Hour" presents its problems, too. A microphone is a very accurate instrument, but also a very sensitive one. When a light finger tap on a "mike" will make V.I. meters go crazy, imagine what a cannon shot or a bomb will do. Wherever possible "The Army Hour" insists on reality—whether it be a thousand paratroopers staging a special attack for the broadcast, or a demonstration of a new machine gun. "Big sounds" have been licked by keeping them in the background. However, the "smaller sounds"—pistols, hand grenades, small bombs have had to be simulated. Generally a small charge of TNT does the job very well, and saves the microphone ribbons for future broadcasts.

### *Tough Problems Solved*

All of these problems presented by "The Army Hour" transcend into the larger problem of organization and production. Stop and think for a minute what you would do if you wanted to present a program that would include a speech from London, a report from Cairo, an interview from Sydney, a demonstration of thirty planes in flight, aerial gunnery training in Texas, and a special new war song from New York City. Picture the maze of wires, phone calls, telegraph messages, and letters that would have to be sent, multiply that about 100 times and you have a rough idea of the organizational work that goes into the making of one "Army Hour".

Each remote broadcast within the United States (and there have been as many as fifteen on one program) requires an announcer, a




BRIG. GEN. JAMES H. DOOLITTLE, AS HE APPEARED ON "THE ARMY HOUR" SHORTLY AFTER HIS FLIGHT TO TOKYO.

production director, one or two engineers, at least one microphone, a "remote" outfit, a field 'phone direct to Radio City, Army passes for the proper people, plus all the advance arrangements so that the right soldiers and equipment will be at the right place.

In New York an orchestra, choir, and actors (for action and "standby" duty) plus the usual array of announcers, engineers, etc., must be on hand.

For the overseas broadcasts, NBC reporters must be advised, radio channels cleared with RCA Communications, Inc., and tests conducted. In addition, the entire program must be integrated into one script, cues must be exchanged with overseas and remote domestic points, and important information cleared with international censors. As if that isn't enough work to cram into one week's time, the entire thing must be rehearsed and timed, and all set to go to air time.

It is not an easy job, nor a simple one. To do it, Eddie Dunham, NBC Production Director, and Wyllis Cooper, civilian writer for the Army, have made close to 2,000 long distance calls (excluding the overseas conversations conducted mainly by shortwave) and sent about the same number of teletype messages. Telegrams, radiograms, and letters are literally innumerable.

The overseas problem falls squarely in the lap of Lathrop Mack, manager of NBC's Department of Special Events, who calls London or Cairo as casually as you'd call the corner drug store. It is he who sees that "Go ahead London" (or Cairo, or Ankara, or Leopoldville) will bring "Hello America" in reply. At work, he is a dervish of activity, speaking to Australia, while Egypt is on the air,—giving cues, orders, cuts. It is his wizardry in setting up channels and emergency alternates that accounts for the few failures of remote broadcasts on "The Army Hour."

### *Hears His Own Voice*

It is all in a day's work to Mack to have his voice circle the globe several times over. In fact, he is greatly amused by a recent two-way circuit with Australia. As he speaks overseas giving pre-broadcast information, he wears headphones to hear what they have to say from the other end. But while he is speaking he hears his own voice coming back from the down-under continent. Despite the fact that his voice travels with the speed of light, the vast distance of the round-trip journey from his microphone back to his headphone was so great, that there was a "time lag" of about 1 7 of a second, and Mack sounded to himself as if he were stuttering.

His work and "The Army Hour" reached a new climax on December 7. The Army had concluded its first year of war—a year of tremendous progress.

With a lavish abandon, the program commemorating the first anniversary of Pearl Harbor spanned thousands of miles, broadcasting from a dozen overseas points, wherever U. S. troops are stationed.

And like the Army, "The Army Hour" and NBC look forward to a bigger and better year of military operations in 1943.



DR. V. K. ZWORYKIN (LEFT) AND DR. JAMES HILLIER OF RCA LABORATORIES EXAMINE THE NEW DESK-SIZE RCA ELECTRON MICROSCOPE. DEVELOPMENT OF THE INSTRUMENT WAS ANNOUNCED IN NOVEMBER AT CHICAGO. IT IS CAPABLE OF THE SAME HIGH DEGREE OF RESOLUTION AS RCA'S STANDARD MODEL.

# Electron Microscope Advances

*INSTRUMENT DEVELOPED BY RCA LABORATORIES, DOING IMPORTANT WAR WORK, BRINGS ABOUT SUDDEN SPURT IN PROGRESS OF SCIENCE; NEW DESK-SIZE MODEL ANNOUNCED.*



By M. Charles Banca

*RCA Victor Division,*
*Radio Corporation of America*

IN 1942, the RCA Electron Microscope's usefulness to science in general and to the war effort in particular was greatly increased. The instrument itself was substantially improved in design and operational simplicity, and the technique of applying it to the varied problems of scientific research was considerably advanced.

So great is the knowledge-gathering potentiality of this new tool of the research worker — an instrument that penetrates far into the ultra-microscopic mysteries of nature—that Dr. V. K. Zworykin, Associate Director, RCA Laboratories at Princeton, N. J., declared recently that it already has brought about a sudden acceleration in the progress of science.

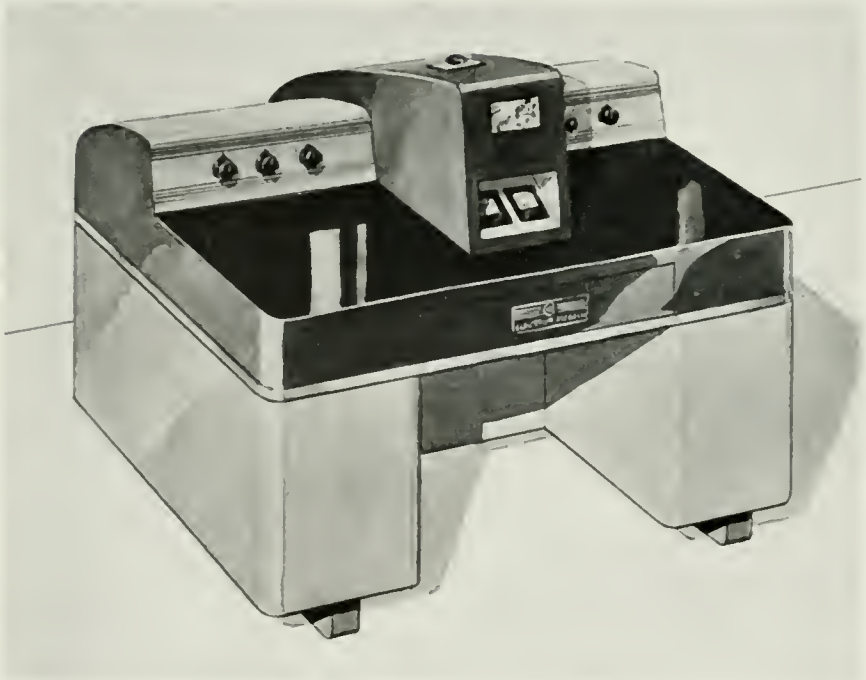
At present, the RCA Electron Microscope is rated at from 50 to 100 times more powerful than the best light microscope. There is reason to believe, according to Dr. Zworykin, under whose supervision the microscope was developed, that — eventually — further improvements in electron microscope lenses will extend this ratio to something like 1,000 to 1.

When these improvements occur, some time in the future, atoms and molecules and the more intimate structures of large molecules and viruses will become visible to research workers. The transition between the realms of living and non-living can be closely observed. Furthermore, the gap between the elemental building blocks of matter and the gross structures of every day life will then be completely filled.

Meanwhile, research is going forward in more than two score laboratories with the standard RCA Electron Microscope introduced two years ago. Scientists agree that their new-found ability to resolve

and magnify the infinitesimally small particles of matter, bacteria, and viruses is producing information extremely valuable to the United Nations' war effort and to America's health, science and industry.

This fact was brought forcefully to public attention during November and December when the first exhibitions and demonstrations of the RCA Electron Microscope were held in Chicago and Washington, D. C. In Chicago, the instrument



THE NEW DESK-SIZE RCA ELECTRON MICROSCOPE, AS IT WILL APPEAR IN ITS COMMERCIAL DESIGN. IT WILL BE BUILT BY THE RCA VICTOR DIVISION.

was the feature exhibit at the joint meeting of the National Industrial Chemical Conference and the Chicago Section, American Chemical Society. More than 24,000 persons registered at this conference. In Washington, approximately 3,500 high Government officials, representatives of the Army and Navy, the diplomatic corps, and leading educators and scientists saw the microscope as guests of RCA Laboratories.

Two outstanding developments in the design of the microscope were announced at Chicago. The first one was a small desk-type instrument, which, while not as versatile as the large standard model, gives the same high degree of resolution and magnification. In this small model, the electron microscope becomes available—after the war—to literally hundreds of medical, university, and industrial research institutions. The other development was the "stream-lining" of the large standard model to effect a 35 per cent reduction in weight, in electronic tubes and in other components. Operation was substantially improved, both as to simplicity and efficiency.

Since practically all of the work being done today with the RCA Electron Microscope is directly related to the war, secrecy guards most of its accomplishments. However, it is permissible to review the progress made in developing the technique of the instrument's application. It is also possible to show how widely distributed the microscope is among hospitals, universities, research laboratories and industry.

The month of December, 1942, marked the second anniversary of the delivery of the first commercial electron microscope. This instrument was delivered to the American Cyanamid Company's research laboratories in Stanford, Conn., and is known as the RCA Type B Electron Microscope, or the standard model.

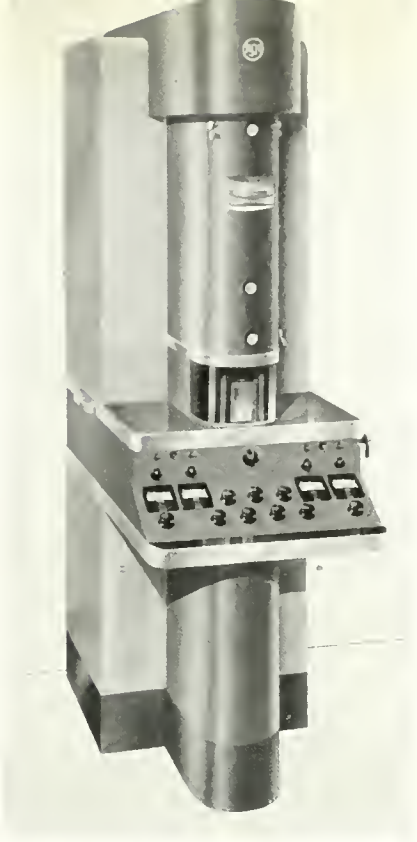
Since that date, forty-six of these instruments have been delivered. Of this number, nine have been exported to our Allies and the remainder were installed in laboratories in this country.

Soon after the first instruments were placed into use, it was realized with the higher magnification available that necessarily the field to be examined was limited. Therefore, it became increasingly difficult to interpret the results obtained with increased magnification. A practical example of such a case was the study of the calcium carbonate where the calcium carbonate (aragonite) was photographed at a total magnification of 85,000 times. Upon examination of this micrograph, it is easily seen that the separate crystals are elongated, porous and quite uniform in shape. However, studies of this same field at low magnification with the light microscope showed what appeared to be large particles. Therefore, it was assumed that there must be some value of intermediate magnification that would tell the full story. As a result of these conclusions, experimenters expanded the range of the electron microscope to cover the region from approximately 200 diameters to 20,000 diameters by varying the length of the specimen holder. These pioneers of electron microscopy soon discovered that the seemingly large particles visible under the light microscope were actually a "Burr" cluster of the crystals visible in the electron micrograph taken at 85,000 diameters. The work of these men and many others soon established the fact that high magnification in itself was not the true answer, but that even low magnification must be covered in order to obtain a comprehensible result. The present instruments, therefore, are capable of magnifications below 1,000 diameters and, by minor adjustments to the instrument, can be carried below 600 diameters.

The magnetic lens used in the

instrument has a depth of focus of more than ten microns (.0004 inches) as compared to an oil immersion lens on a light microscope which has a depth of focus of somewhere in the order of .08 microns (.0000032 inches). A practical example of the extreme depth of focus is illustrated in a micrograph of aluminum oxide monohydrate where two of the crystals are standing on end and one on its side, the total field being in focus. This naturally lends itself to third dimensional studies by stereoscopic pictures and so a specimen holder was designed and applied to the instrument.

In the beginning, there was one standard specimen preparation wherein a 200 mesh etched screen was used to support .01 micron (.0000004 inches) collodion film. This film was prepared by floating a small drop of 2 per cent collodion dissolved in amyl-acetate on water, placing the screen on this film and picking the screen with its film up by means of a specially designed hook. Upon this film was placed the specimen solution. This method was suitable for ordinary work covering particle study and bacteria. However, this placed great limitations on the fields of application of the instrument and studies were made into the matter of various specimen preparations. Since that time, many different plastics have been applied as specimen supports. Other methods have utilized mixing the specimen directly in the film material so as to obtain better dispersion. Considerable and detailed work has centered about obtaining better dispersion, since the finer the particles the more difficult becomes this problem. Many new and interesting techniques have been developed.



THE "STREAMLINED" DESIGN RECENTLY CONCEIVED FOR THE STANDARD MODEL RCA ELECTRON MICROSCOPE.

CRYSTALS OF ALUMINUM OXIDE MONOHYDRATE, AS SEEN BY THE ELECTRON MICROSCOPE.



In the study of bacteriology, there has been considerable discussion as to the effects of the electron beam and the vacuum upon the bacteria themselves. Obviously the bacteria cannot be studied in motion since the vacuum removes any liquid, the medium through which the bacteria is able to move. As to the bacteria itself, the vacuum necessarily causes all the moisture to evaporate off its surface. However, this does not necessarily mean that all moisture must be given up from the internal portions of the bacteria. As a matter of fact, bacteria have been left in the microscope under the vacuum for extended periods of time before visible changes occurred. This rule is not absolute for in some cases changes have been noted in very short times. As to the matter of the electron beam producing a change, it is generally believed that the electrons bombarding the nuclei are fatal to the bacteria. Just recently a paper has been published abroad claiming that bacteria have survived photographing in the microscope.

Some work has been done on the application of heavy-metal germicides which react selectively with certain components of protoplasm but as yet no systematic study of the factors involved has been carried on and results so far obtained show definite promise of an interesting field of study.

At first, it was believed that the electron microscope would not be too successful in the study of solid surfaces. The metallurgist was in great need of an instrument of higher resolution than the light microscope for broadening his study of the surface of metals. There was soon developed the now famous replica method for adapting this instrument to special work. The original method consisted of preparing the surface to be studied, then evaporating a thin coat of silver onto this surface in a vacuum. This silver film was then stripped from the surface and a thin collodion film applied to it. The silver film was then dissolved from the collodion film with acid, leaving

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DIFFRACTION PATTERN OF ZINC OXIDE OBTAINED WITH THE ELECTRON DIFFRACTION CAMERA ATTACHMENT OF THE MICROSCOPE.






"BREAKFAST AT SARDI'S" IS ONE OF THE PROGRAM INNOVATIONS OF THE BLUE NETWORK. HERE, TOM BRENEMAN, HOST, IS SHOWN INTERVIEWING ONE OF THE GUESTS IN A HUMOROUS SEQUENCE.

# Blue Trys New Program Ideas

*CARLIN SAYS BROADCAST SCHEDULE ON NETWORK IS HIGHLY FLEXIBLE STRUCTURE; ADJUSTS OFFERINGS TO COINCIDE WITH CHANGES AS PLANS ARE MADE TO TEST DIFFERENT SHOWS.*



By Philips Carlin

*Vice President in Charge of Programs, Blue Network Company, Inc.*

STEPPING out onto new paths while keeping its hand on the pulse of public opinion, the Blue Network Company has tried and proved an entirely new conception of network program structure in the eleven months of its existence as an independent entity.

To us, the program schedule is a flexible structure for which the needs and wants of the public are as the breath of life.

Just as a good chef keeps his mind on satisfying the myriad and shifting tastes of his customers—today's and tomorrow's customers—without regard for what somebody wanted last week or last year, so the BLUE is constantly offering programs in line with changing conditions, changing thinking, changing habits. We have eagerly welcomed new ideas and new techniques, feeling certain that a live network must be always ready to take a change.

This vision of the BLUE as a medium always alive to change is in line with the whole trend of thoughts today in every field, and we look on radio as one of the most important methods of helping people to adjust themselves to the revolutionary changes that are accompanying the war.

Looking ahead to 1943, we are already working on plans for more of the new type of daytime show, such as "Broadcast at Sardi's," and the service programs which will be of vital necessity to every citizen. One kind of program intended to help solve the food problem, with gas rationing and meat and butter shortages revising cook books, and dehydrated foods replacing canned goods ("Mystery Chef") is already on the air. Conservation will continue to be an all-important theme. The BLUE may also enter other fields as dictated by public necessity. These may well include the

medical, clothing and household appliance fields. Even such things as patterns, with their sale increasing by the thousands, might be the subject of a program.

Never afraid to tackle something new, we have tried out an average of ten or more shows a month during the last year. With such variety, there have been some "flops" which were instantly recognized and thrown out but a majority have proved their worth and built up a public following.

Since radio's first aim is the winning of the war, the program structure throughout the year has been imbued with a definite war flavor. A recount of the total amount of time devoted to the war effort on the BLUE from January 1 through October 30 shows that 525 hours of sustaining time, and 80 hours of sponsored time (not including local programs on WJZ) were used for this purpose. Of this total 232 hours of network time were devoted to programs presented in cooperation with Government agencies.

Aside from Government programs, contribution to the war effort was made in sustaining shows presented by other organizations. One of this type, "This Nation at War," presented by the National Association of Manufacturers, pictured the work being done on the home front. Another "Men, Machines and Victory," presented by the National Safety Council, dramatized the danger to the war effort of accidents in war production plants. In addition, there were a host of other sustaining shows presented by the BLUE itself.

Alive to the public's hunger for news, the BLUE has built up an impressive list of commentators and news reporters which now includes H. H. Baukhage, Earl Godwin, John Gunther, William Hillman, James G. McDonald, Drew Pearson, Roy Porter, Raymond Gram Swing, Lowell Thomas, Dorothy Thompson, Edward Tomlinson, John Vandercook and Walter Winchell.

In the field of children's programs the BLUE has forged ahead, too, with Hop Harrigan, Jack Armstrong, Captain Midnight, Don Winslow of the Navy, the Lone Ranger, Scramble, Little Blue Playhouse and The Sea Hound.

Realizing that to achieve a varied offering the program department must draw on every source of ideas, the BLUE early in its career opened the door to the independent producer, gave him air credit, encouraged him to submit new ideas and talent. This cooperation resulted first in good shows at the lowest practical cost and then in commercial sponsors.

Another new idea, whereby the BLUE gets the aid and counsel of its affiliated stations, was the inauguration of weekly "closed circuit" broadcasts on which we speak with station staffs and ask for an expression of opinion on programs.

The results of this aggressive desire to cooperate in seeking ideas and opinions can be seen in the affiliated stations' quick acceptance of sustaining shows, quick sponsorship by advertisers, and in rising ratings. For the first half of 1942, the BLUE's total of rating points is well over those for the same period in 1941, and many of the shows did not start until the Fall.

On the whole, we feel that the BLUE has done a good job of giving the public what it wants, which means giving the advertiser what he wants. And the changing world of 1943 will find the BLUE flexible and sensitive to its every need.

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ACTIVITIES OF THE ARMY AIR FORCE ARE BEING DESCRIBED IN THIS SCENE FROM A BROADCAST OF "THIS NATION AT WAR," AT ALBUQUERQUE, N. M., BY THE BLUE NETWORK.





ROBERT SHANNON (RIGHT CENTER), GENERAL MANAGER, RCA VICTOR DIVISION, PRESENTS SUGGESTION SYSTEM AWARD TO JOSEPH ECKERT. OTHER AWARD WINNERS IN THE GROUP ARE (LEFT TO RIGHT) B. J. MC CORMACK, PETER KRUSS, THOMAS MUCKENFUSS, DAVID RYAN, DAVID SMITH, PAUL LEDYARD, LEO DENSON.

# Ideas Spur War Work

*SUGGESTION SYSTEM AT RCA VICTOR DIVISION PROVES HIGHLY EFFECTIVE; 23 WORKERS WIN NATIONAL WPB HONORS.*



By Elmer C. Morse

*Personnel Manager,*
*RCA Victor Division,*
*Radio Corporation of America*

AMONG industrial programs to increase war production and improve quality of war equipment for the armed forces, none has proven itself more effective than the Suggestion System.

In addition to its effect on production, a successful suggestion system has an important influence on employee morale. The worker is made to feel that his ideas about his work or about the company and its work are welcome. He is made to feel that he, personally, counts in a large organization and that he can make a real contribution to his own as well as to his company's progress through ideas over and above the direct responsibility of his everyday job.

In peace-time, the Suggestion System has as its objective more efficient operation, lowered costs and better quality, so that products and services can be more competitive. The employee benefits as the company benefits and is able to promote more employment, better security and more opportunity for advancement.

In war-time, the main objective of the Suggestion System is to produce vital radio and sound equipment for our armed forces in larger quantities, with better quality, and with the fullest utilization of plant, equipment, machinery, tools, materials and man-power.

The value of employee suggestions in the battle of production is clearly recognized by the War Production Board which, early this year, set up a system of awards for outstanding suggestions that aid the war effort.

During the year, thousands of workers' suggestions were sent to Washington by the Labor-Management War Production Drive Committees in the Nation's industrial plants. A high-powered awards committee, made up of scientists, industrialists and labor leaders, sifted them and sent the most meritorious to war industries throughout the country for application in those plants. The War Production Board award committee then selected six most outstanding of the total submitted and awarded their authors citations. Fifty-five Certificates for Individual Production Merit were also issued, together with eighty-seven Honorable Mentions. Fifty-five companies were represented in the awards.

Among the 148 winners, twenty-three were from the RCA Victor Division. One RCA worker, Edwin C. Tracy, a field test engineer from Camden, received the highest award, a citation. Nine other RCA workers were awarded Certificates of Individual Production Merit and thirteen other RCA men were accorded Honorable Mention.

Since the Citation is the highest honor the War Production Board confers, it has been considered by many as comparable in industry to the Distinguished Service Medal of the armed forces. The six war Production Heroes who earned it, were called to Washington on December 10, to receive their awards from President Roosevelt. Accompanying them were four men who had earned Certificates. The latter were selected because their recommendations had been most widely adopted by war industries. Among the four was another RCA man, Stanley Crawford, a materials inspector from Camden.

Thus, out of ten men honored by the President in the White House ceremonies, RCA was the only company to have two representatives in the group.

Although the application of the suggestion system to the war effort has given strong impetus to war production throughout the Nation, the basic idea is not new. RCA recognized its merits fifteen years ago and put it into operation. It was received with enthusiasm at each of the company plants and has been an effective means of cementing closer understanding between management and employees ever since.

At the Camden plant, for example, its general usefulness has increased year by year. In 1938, a total of 2,562 suggestions was submitted, and 454, or 18 per cent, were found usable. The following year suggestions increased to 10,298 with 16 per cent acceptances. In 1940, the number of suggestions was 11,031 with 18 per cent accepted. In 1941, 25,701 suggestions were received and 15 per cent accepted.

In November of 1941, a concerted drive was made to place emphasis on quality, rather than quantity suggestions. Nevertheless, 23,064 suggestions were turned in up to the end of October 1942. Of these, 7,582 or 32 per cent were accepted.

Camden's joint Labor-Management War Production Drive Committee has had an important influence on the improved results from the Suggestion System. They have appointed a sub-committee with an equal number of management and labor representatives. This committee has made many valuable suggestions for encouraging suggestions from workers, for making suggestion boxes and suggestion blanks more attractive and, above all, for improving the speed and efficiency with which suggestions are routed through the organization for decisions.

The RCA Suggestion System has five basic objectives: to stimulate thinking among employees; to obtain employee ideas that will lead toward better production and lowered costs; to create better understanding and improve relations be-

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PRESIDENT ROOSEVELT SHAKES HANDS WITH STANLEY CRAWFORD OF RCA, WHO WAS ONE OF TEN TO RECEIVE PRESIDENTIAL RECOGNITION FOR WAR PRODUCTION MERIT. IN THE BACKGROUND ARE EDWIN C. TRACY OF RCA (LEFT) AND DONALD NELSON, HEAD OF WAR PRODUCTION BOARD.

# 2 HONORED BY PRESIDENT

*Edwin Tracy and Stanley Crawford, RCA Men, Among Ten From Nation Receiving Special WPB Awards in Ceremony at White House.*

TWO RCA Victor Division war workers whose outstanding suggestions are materially furthering the war effort received recognition usually accorded military heroes at a series of ceremonies in Washington, climaxed by the presentation to them of awards by President Roosevelt at the White House on December 10th.

The awards, the first to be made by the President to industry's "heroes", were under the auspices of the War Production Board and were conferred on the RCA employes on recommendation of the plant's joint management-labor War Production Drive Committee to Beat the Promise.

Stanley Crawford and Edwin Tracy were the two men whose home front contributions to the war effort received Presidential recognition. Crawford, previously awarded the War Production Board's Certificate of Individual Production Merit, is a materials inspector in the Camden plant and lives at Woodlynne, N. J. Tracy is an installation and service engineer whose home is at Rockville Center, L. I.

Crawford's contribution was a simple caliper which salvages thirteen out of sixteen castings formerly rejected, thus saving valuable semi-finished material. It is now being used in war plants throughout the country, avoiding enormous metal waste previously regarded as unavoidable.

The contribution by Tracy is a highly technical electrical apparatus to test radio equipment destined for fighting planes. It accomplishes in three minutes, with higher accuracy, a job that formerly required eight hours.

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FRED BATE, MANAGER OF THE NBC INTERNATIONAL DIVISION, AT HIS DESK IN RADIO CITY, NEW YORK.

# U. S. LEASES SHORT WAVES

*Union of Private Broadcasters with Government Agencies Means Closer Coordination in Job of Off-setting Nazi Propaganda, According to Royal.*

ON November 1, 1942, the United States Government leased all of the nation's short-wave transmitters, including NBC's powerful 50,000 watters, WRCA and WNBI, located at Bound Brook, N. J.

The contract signed with the Government calls for a five years' lease but may be cancelled by Washington before the expiration of that period. Shortwave broadcasters, according to the pact, continue to operate their transmitters without profit in return for which Uncle Sam will pay the cost of operations.

This union of private broadcasters with the Office of War Information and the Coordinator of Inter-American Affairs means a closer "coordination between practical radio operators and those of the Government agencies who can give proper directives," said John F. Royal, NBC vice president in charge of international broadcasting.

Furthermore, Royal declared, coordination and consolidation of American short-wave stations means that this country will be in a more potent position to help crush the short-wave efforts of the Nazis and their totalitarian henchmen.

Shortly after the Government stepped into the picture, NBC's transmitters increased their service to Latin America by many hours a day. Programs in Spanish were extended from four hours and forty minutes to eight and one-half hours. Portuguese broadcasts, directed to Brazil, were increased from two hours and fifteen minutes to six and one-half hours.

Spanish features are transmitted from 5:30 p.m. to 2:00 a.m. over NBC's station WNBI, General Electric's WGEA and WGEO, Westinghouse's WBOS and World Wide's WRUW, all with 50,000 watts. Portuguese programs are now heard from 5:00 p.m. to 11:30 p.m. EWT. over NBC's WRCA and Columbia's WCBX. The first three hours of these programs for Brazil originate in NBC's studios, while the remainder of the Portuguese schedule is programmed from CBS studios.

With the increase in broadcasting to Latin America, there will be a definite trend toward a more complete and varied program schedule, covering all phases of inter-American collaboration. Especially will this be true in the special events field, where NBC will broadcast an increasing number of addresses by visiting Latin American personalities and also special ceremonies from all parts of the hemisphere. Affiliate stations of NBC's Pan American Network are also contributing an important share in inter-American cooperation by regularly rebroadcasting in their respective countries many of the shows offered to our neighbors through NBC International, and by sending us special musical and cultural programs for rebroadcast in the United States.

Material now being short-waved to listeners South of the border consists of many old, established programs as well as several new fea-

ELI BUCK IS DIRECTOR OF LATIN AMERICAN PROGRAMS FOR THE NBC INTERNATIONAL DIVISION.



tures. Among the programs that are being continued are the commentaries of Alejandro Sux: Sunday, Tuesday and Friday at 8:30; El Baron Eje: Fridays at 8:45; Americanos Todos: Monday, Wednesday, Friday and Saturday at 9:00; Radioteatro de America (plays by Arch Oboler): Wednesday at 8:30; La Marcha del Tiempo (March of Time): Thursday, 9:30; Epopeya del Nuevo Mundo: Monday, 8:30; Fernando Ortiz Echague: Monday and Thursday, 7:00; Tributo o los Heroes: Sunday, 8:15; NBC Symphony Orchestra: Sunday, 9:30; Contraespionaje (Counter Spy); Tuesday, 9:30.

Some of the new features are: Nuestro Sur (Our Southland): Sunday, 10:45; Industrias del los Estados Unidos: Sunday, 8:45; Poems of Walt Whitman: Monday at 9:15, and the transcribed music of Al Roth, Glenn Miller, Dinah Shore and Bing Crosby.

Four new shows have been created for transmission to Brazil. They are: Latin American Artists; New World Music; "What D'Ya Know?, quiz show; and Fighting America, all broadcast in Portuguese.

In addition, a series of 15-minute vocal and instrumental recitals are broadcast every week-day at 8:15. Among those participating are Mario Silveira, baritone; Rey de la Torre, guitarist; Marcella Uhl, mezzo-soprano; and Albert Cazentre, tenor.

The full cooperation with Government agencies that Mr. Royal spoke of was evident on Saturday, November 7, when President Roosevelt sent his personal message to the French people. OWI arranged to have NBC's short-wave transmitters beamed to Europe to carry the statement. The stations continued to function in this manner 24 hours a day, repeating the presidential message and including important declarations that explained the purpose of the American expeditionary force in French Colonial territory. When the emergency subsided, NBC's transmitters returned to more normal broadcasting, with special emphasis placed on news reports in the German, French and Italian languages.

Before the signing of the contract with the Government NBC's English Section in the International Division had 34½ hours weekly on the air. The English Section now has 35 hours weekly, broadcasting daily from 1:00 to 6:00 p.m., EWT. While the number of broadcasting hours remains substantially the same, the time of NBC's transmissions have been adjusted so that programs can reach the areas for which they are intended at the best possible listening time.

As the schedule is now arranged, the English language programs may be heard in the British Isles from 6:00 p.m. to 11:00 p.m. These hours are considered ideal for members of our own armed forces stationed in this area and also for the British people. While the United Kingdom is the focal point for these broadcasts they may also be heard throughout the West Indies, North Africa and the Middle East. However, in the past, NBC broadcasts beamed at England, have been heard in such far separated places as Alaska, India, British South Africa and Australia.

The technical handling of the English short-wave broadcasts is so arranged that programs are originated in the Radio City studios, sent through the master control board, and then routed to the OWI headquarters at 224 West 57th Street, New York. The OWI then sends the programs to selected transmitters.

While a large majority of these English language programs are designed especially for Americans serving overseas in the armed forces, many of them are built for

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SECTION OF THE NEWS ROOM IN NBC'S INTERNATIONAL DIVISION. HERE COPY IS RECEIVED FROM PRESS ASSOCIATIONS AND TRANSLATED INTO VARIOUS LANGUAGES BY NEWS COMMENTATORS.



THE BOSTON SYMPHONY ORCHESTRA, WHICH IS BEING HEARD IN A SERIES OF PROGRAMS BROADCAST EXCLUSIVELY BY THE BLUE NETWORK.

# BOSTON SYMPHONY ON BLUE

*Famed Orchestra, with Serge Koussevitsky Conducting, Has opened 46-Week Series of Broadcasts, Including "Pops" Concerts.*

MUSIC in its most lyrical and etherial flights is said to serve a war-torn world, offering a spiritual analgesia to revitalize the tired nerves of a hard-working people on the home front. In appreciation of this view, the BLUE Network has added the Boston Symphony Orchestra, conducted by Dr. Serge Koussevitzky, to its growing list of cultural music programs, which already includes the Saturday afternoon broadcasts of the Metropolitan Opera.

To many millions of war workers and soldiers in training on American soil, the BLUE program executives believe, surcease from the pressing demands of war will be found in great measure in the new orchestral series, which opened December 26 to be heard each Saturday thereafter from 8:15 to 9:15 p.m., EWT.

In these broadcasts, the Boston Symphony Orchestra will be heard over a coast-to-coast hook-up for the first time in five years. Mark Woods, president of the BLUE, is responsible for its return to the radio audience of the BLUE Network.

The long term contract, providing the radio public with the concerts of the orchestra weekly through its long season of 46 weeks each year is unprecedented. The majority of the concerts will originate in Symphony Hall, the orchestra's own auditorium in Boston.

At the expiration of the regular season, May 1, the BLUE Network will bring to its vast audience the "Pops" concerts under Arthur Fiedler until early July and the open air concerts on the Charles River Esplanade which follow. It is hoped conditions will permit the resumption of the Berkshire Symphonic Festival at Tanglewood, in Lenox.

According to published acknowledgments, the Boston Symphony Orchestra unquestionably is among the finest in the world. Its conductor for the past twenty-eight seasons, Dr. Koussevitzky, has the reputation of being the greatest living exponent of Russian music, and the most consistent champion of modern music. He is completely the perfectionist, demanding nothing short of an inspired performance.



SERGE KOUSSEVITSKY

Firmly espousing the cause of the contemporary composer, Dr. Koussevitzky has declared: "We cannot refuse a careful performance and a fair hearing to the composers who are working in our own time." No other conductor in this country has brought forth so many new works by the world's composers.

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The Boston Symphony Orchestra, under the direction of Serge Koussevitzky, has signed a new long-term contract to make Victor Red Seal recordings, according to Frank B. Walker, of the RCA Victor Division. The contract also calls for the exclusive recording performances of the Boston "Pops" Orchestra, with Arthur Fiedler as conductor.

Just 25 years ago, the first Victor records of the Boston Symphony were released. These discs were history-making in the phonograph art, because for the first time an orchestra of 100 men was recorded. Up to this time, the size of an orchestra for records was limited to forty men. Since 1917, the records of the Boston Symphony Orchestra have sold in the millions. With Dr. Koussevitzky as conductor, the orchestra's records have attained their greatest popularity.

### Ideas Spur War Work

*(continued from page 21)*

tween management and employees: to identify progressive workers to the management; and to stimulate all the workers to a better appreciation of the important role which they play as individuals in shaping their own future with the organization in direct proportion to their contributions to the well-being of their company.

Distinctively colored suggestion boxes are placed throughout the plant and in the offices. At each box is a supply of suggestion blanks. Every means of communication is employed to encourage suggestions. Messages are recited over the plant sound system: posters are put on walls and bulletin boards; awards for outstanding suggestions are played up in the company house organs. Big awards are made personally by top management representatives. Public presentation of awards are made at plant rallies and on special occasions. All-expense furloughs to famous vacation spots are offered as incentives in addition to the cash awards (payable in War Bonds and Stamps) which are made in direct proportion to the estimated value of the suggestions.

The suggestion blank is in three parts, each numbered identically. On the main section, the suggestor outlines his idea. On one of two perforated stubs attached he writes his name, clock number, department number and building number. The second stub he keeps as evidence that he has put in a suggestion.

Suggestion boxes are regularly emptied not less than three times each week. All suggestions are read by the Suggestion Superviser and his staff who are members of the Personnel Department. They are then assigned to five full-time investigators who check the employee's idea with his foreman and others who may be interested. After that, the recommendation is expedited with all possible dispatch. The identity of the suggestor is known only to the Suggestion Supervisor to assure unbiased consideration for every idea submitted.

If the suggestion has possibilities of adoption, the investigator clears the idea with the Engineering Department where blue-print changes are made, if necessary, and comments about practicability are obtained. Next, the idea is checked with the Process Department for additional comment and whatever process changes are needed. The investigator then checks the production orders on which the suggestion applies and obtains a report on quantities in order to estimate the savings.

The suggestion now is tentatively adopted. It becomes effective after consultation with the Control Department where labor and material savings are recorded. The idea is finally returned to the Suggestion Supervisor where the extent of an award is determined.

#### *Records are Kept*

If the suggestion is rejected, the investigator attaches comments giving specific reasons for the rejection. The decision is entered in a master book opposite a serial number. The suggestion then is forwarded to the suggestor's foreman who explains the situation, thanks the employee for his interest and encourages further submission of ideas. If the employee is dissatisfied with the rejection, a reinvestigation of his suggestion may be opened by the Suggestion Supervisor. The employee also is free to reopen his suggestion at any time.

After a suggestion has been adopted, if it is considered to be of value to the war effort, the Suggestion Supervisor sends it to the Labor-Management War Production Drive Sub-Committee for certification and transmission to the War Production Board in Washington. There it is reviewed by the Committee on Awards which notifies the plant War Production Drive Committee of whatever action is taken.

Ninety per cent of all suggestions made at RCA's Camden plant since Pearl Harbor, have been in connection with war work. Among them have been recommendations for the conservation of essential materials, elimination of rejects, quality improvements, methods for decreasing production and test time, simplification of operations, elimination of bottlenecks, increase of efficiency, and improvement to morale.

### Industrial Power Rising

*(continued from page 5)*

Science, through development of the electron tube, put radio in the fight and made it indispensable to the modern mechanized army, to the air corps, to the fleet, and to the merchant marine. Without the radio tube so wonderfully developed since World War I, radio could not play the important role it now has in warfare. The electron tube made radio equipment compact, portable, mobile, efficient and extremely dependable. That was not so with the cumbersome wireless apparatus that used the spark transmitter and crystal detectors in the first World War. It was not until the final period of the conflict that the radio tube began to find service in the Army and Navy.

Radio now qualifies as the voice and ear of the Army Signal Corps, of Naval Communications and of the Air Corps. We have but to look at the global war map to realize the great importance of radio. Its definite assignments and achievements necessarily are military secrets. But when we compare the present demands upon communications with those of the first World War, it is easy to understand that radio's present role is a thousandfold more important. The airplane, the world-wide transport problem, and blitz warfare, all of which call for utmost speed and efficiency in communication, have multiplied the demands and responsibilities of radio.

Within the past year—a year of tireless effort in the manufacturing plants—the men and women on the production front have given the American armed forces the finest radio equipment in the world. As the war rages into 1943, every American finds himself and herself linked in some way with the battle. There must be no let-up on the home front. Every day in the New Year must find production rushing full speed ahead to the battlefronts. Then, and only then, will the last battle end in our victory.




COMMANDER J. F. BATES, USN, PRESENTS THE ARMY-NAVY "E" FLAG WITH STAR TO THE RCA VICTOR DIVISION'S CAMDEN PLANT. RECEIVING IT ARE ARNOLD WEBER AND GILES C. FRAZIER.

# PLANT WINS "E" WITH STAR

*RCA Victor Division Receives Army-Navy Flag at Huge Rally; Pennant is Third Award to Camden Plant from Armed Forces.*

THE Army-Navy "E" Flag with Star was presented to the RCA Victor Division's Camden, N. J., plant during a huge rally of RCA war workers in Johnson Park, adjacent to the plant, on December 7.

The award was the third to come from the armed forces of the United States to the Camden group. The first was the pennant of the Navy's Bureau of Ships. This was followed by the Navy "E" Flag. The star on the latest award—the Army-Navy "E"—indicates an additional six months of outstanding performance in the production of war equipment vital to the Navy.

Commander J. F. Bates, Resident Inspector of Naval Material at RCA Victor, presented the Army-Navy award in the December 7 ceremonies. It was received by A. K. Weber and Giles C. Frazier, who represented the labor-management War Production Drive Committee of the plant. A. L. Pipper, RCA Victor executive, acted as master of ceremonies.

## Blue Wins 6 Firsts

Six first places were won by Blue Network performers or programs in the seventh annual poll conducted by *Motion Picture Daily*. More than 600 radio editors and columnists participated in the voting. Five BLUE performers or programs scored in second places, and four in third places.

## War Programs Increase

NBC's increasing participation in the war effort is strikingly demonstrated in preliminary statistics on program makeup for 1942, which show a gain of 23 per cent in public service programs and 28 per cent in newscasts.

Statistics, projected for the full year on the basis of actual figures for the first ten months, show that public service programs increased from 30 per cent of program hours in 1941 to 37 per cent for 1942.

News programs, including reports, analyses, foreign pick-ups and special events, increased from 10.5 per cent in 1941 to 14.2 per cent of all program hours for 1942. In other words 2,653 of the year's 7,175 hours for all programs on NBC in 1942, were allotted to public service. Of the 2,653 hours, 1,015 hours were devoted to news.

## BROADWAY PLAY GIVEN TRY-OUT ON NETWORK

*Radio and Stage Techniques are Blended in Novel Dramatic Experiment.*

RADIO played host to Broadway last week when representatives of the two entertainment media sat down together to witness the birth of a novel experiment, which is expected to make theatrical history.

The occasion was the premiere broadcast of "Audition Preview," a new method of dramatic production for trying out plays for Broadway managers, picture companies, and playwrights.

Brainchild of Fritz Blocki, radio-writer-director, the program, which was launched over the nationwide BLUE Network, "lend-leased" radio's facilities and techniques to the theater in an effort to give producers more assurance of the quality of a scrip before risking thousands of dollars in hiring a theater and obtaining scenery.

On hand as master of ceremonies was Eddie Dowling, actor-manager, who is famous for his innovations in the theater world. Dowling, who played host and narrator during the performance, introduced the new idea and set the stage with verbal scenery.

"The Wind Is Rising", by Harry Kleinert, of Philadelphia, was the script chosen for the tryout. Selected out of scores of others because of its adaptability to the experimental venture, the play centered about the underground movement in conquered France.

Claire Luce, international stage star, headed an impressive cast. Opposite Miss Luce, Myron McCormick, of Broadway, Hollywood, and radio, shared the lead with Frank Lovejoy, long a favorite of radio listeners. Other members of the cast were Selena Royle, Ethel Owen, Jean McCoy, John Brown and Santos Ortega.

Tucked away in a different studio from the actual production unit, were about 100 guests, especially invited from the ranks of radio and drama critics, and celebrities of stage, screen, and air.

During the intermission and after the broadcast, which took an hour and a half, Dowling invited critics to the microphone and interviewed them on their opinions of the new tryout plan.

Still sifting the comment on his idea, Fritz Blocki is amazed at the similarity between professional criticism and that from laymen. Among the letters from radio listeners, received by the BLUE Network, are constructive suggestions and high praise, according to Blocki.

When Blocki, who is now in the radio production staff of Benton and Bowles, conceived the idea, he insisted that the plays selected would not be adapted to radio. Carrying out his new method of production, Blocki employed sound effects and music in the drama, blending radio technique with that of the stage.

## NBC Leads in Poll

NBC programs and personalities again swept the annual poll of radio editors of the United States and Canada conducted by *Motion Picture Daily*. In the thirty-four classifications, NBC took eighteen first places. The remaining sixteen were shared by the other networks and unaffiliated performers. NBC took eighteen second places and twenty-one third places.

## Visit Ordnance Plant

War production workers in the RCA Victor Division plant at Camden gained a sharper understanding of the actual part their output plays on the far-flung fighting fronts of the nation as a result of a trip taken by a dozen of their leaders through the Army's Ordnance Replacement Training Center at Aberdeen, Md. The trip was made under the auspices of the Division's Labor-Management War Production Drive Committee to Beat the Promise on war production schedules, with the cooperation of the Army Ordnance Department.



## Sings at 300 Rallies

*One of 1942's real war effort personalities was Lucy Monroe, the RCA Victor Division's Director of Patriotic Music. Known as the "Star Spangled Soprano," she travelled close to 50,000 miles, visiting twenty-four States. She made more than 300 appearances at Army camps, naval bases, industrial plants, and before patriotic rallies. Her present work, she says, is the most satisfying of her career, which includes singing for radio, the concert stage, musical comedy, operetta, and opera.*

## NBC Chimes Exclusive

The three musical notes which, for more than fifteen years, identified programs broadcast by the Red (now NBC) and Blue networks, became the exclusive property of the National Broadcasting Company on December 1 and now is used only on the NBC network. The Blue Network ended its use of a musical signature and announces itself now as, "This is the Blue Network".

# BUILDS NEW TIME CONTROL

*Electric Clock System Designed by NBC Engineers Does Not Vary Third of Second in Day; Problem of Deviation Eliminated.*



O. B. HANSON AT THE PANEL BOARD OF NBC'S NEW TIME CONTROL SYSTEM.

A PRECISION electric clock control system that does not vary more than one-third second a day, is now in operation in National Broadcasting Company's Radio City headquarters. The system was developed by the NBC engineering staff under the direction of O. B. Hanson, vice president in charge of engineering. Similar installations are being made at the network's division offices in Chicago, Hollywood, San Francisco, Washington, Cleveland and Denver.

Need for a highly accurate time clock control has been increasing since war time activities commenced to add heavy loads to commercial power lines. As a result of these huge power demands, many of NBC's operating divisions, particularly New York, have encountered deviations in the frequency of the alternating current supply lines. Ordinarily of small magnitude, these variations, nevertheless, were sufficient at times to become a serious problem in network operation where programs must be switched on a split second basis. The new system, with its accuracy of better than one part in 205,000, eliminates this trouble.

NBC's time control is based on the use of a special tuning fork vibrating at the rate of 60 cycles a second within a vacuum chamber. The fork's movement creates infinitesimal impulses which are amplified millions of times by a series of vacuum tubes, until sufficient power is generated to operate the required number of clocks. In Radio City alone, 200 clocks must be synchronized.

To check the absolute accuracy of the system, the master clock is compared daily with the extremely accurate time signals transmitted by radio from the U. S. Naval Observatory, Washington, D. C.

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*U. S. Leases Short Waves*

*(continued from page 23)*

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British audiences and some should be equally acceptable to any English-speaking listener.

NBC's English program schedule is patterned in such a way that the best War Department, OWI and NBC programs are included in the schedule. Letters from service men show a strong preference for news, dance music and sports, so naturally the schedule includes many such shows.

Currently, the English Section is transmitting 14 sports programs each week. Variety shows are highlighted by "Service Serenade," "Fashions in Jazz" and "Command Performance." World wide interest in news from America is fulfilled by four news broadcasts a day.

Before the leasing of private short-wave facilities by the Government, NBC's English Section carried more than 20 commercial programs originated by NBC's domestic network or by the English Section. At the present time, all commercials have been cancelled but it is hoped that these broadcasts may be resumed with the commercials deleted.

Mr. Royal pointed out that the OWI "is eager to continue the competitive programming policy which has been the foundation of the American system of broadcasting and which has made the short-wave programs from the United States the most eagerly listened to of any country in the world."



STANDARD TIME INDICATED
RECEIVED AT
160 W. 48th ST.
NEW YORK CITY
BR 9 1269 LD 5 6084
TELEPHONE YOUR TELEGRAMS TO POSTAL TELEGRAPH

Postal Telegraph
Mackay Radio · Commercial Cables · All American Cables · Canadian Pacific Telegraphs

N.WA444 (TWO) GOVT TWS PD 3 MNYS=PG WASHINGTON DC 21 356P
TO THE MEN AND WOMEN OF RADIO CORPN OF AMERICA=
(NEWYORK NY)=

DEC 21 PM 10

ON THIS SACRED DAY OF OUR LORD WE, THE SOLDIERS ON THE FIRING LINE, GIVE THANKS TO YOU SOLDIERS ON THE PRODUCTION LINE FOR THE SINEWS OF WAR THAT MAKE VICTORY POSSIBLE. WE ARE DEDICATING THIS CHRISTMAS DAY TO THE DEFEAT OF OUR ENEMIES--YES, THIS CHRISTMAS DAY, THE DAY AFTER AND EVERY DAY THEREAFTER UNTIL WE ESTABLISH PEACE ON EARTH AND GOOD WILL TO MEN=
MACARTHUR.

THIS CHRISTMAS MESSAGE TO RCA'S "SOLDIERS ON THE PRODUCTION LINE" FROM GENERAL DOUGLAS MACARTHUR (LEFT) WAS RECEIVED BY RADIO CORPORATION OF AMERICA IN NEW YORK ON DECEMBER 21.

### *Sarnoff Lauds Radio*

*(continued from page 5)*

programs have been directed to the service men, while many other shows have originated in training camps.

Supplementing nation-wide broadcasting on an international scale, America has continued to develop short-wave stations which have proved their great worth during the past year. Through these stations news and information have been broadcast. Short waves have linked the United Nations; they have actually "poured" news into invaded countries. An outstanding example of the usefulness of short waves is found in President Roosevelt's broadcast in French to the French people, on November 7, when he assured France in connection with the AEF invasion of French Africa, that the United States aimed to free it from the Nazi yoke.

Radiophotos are on the wing from more points on the map than were possible a year ago. RCA, New York, now receives and sends pictures from London, Stockholm, Cairo, Moscow and Buenos Aires, while the terminal at San Francisco plucks pictures from space from Melbourne and Honolulu.

Only the end of the war can reveal the great part the communications men have played, and how fortunate America is in having a world-wide radio system second to none in coverage and efficiency. It is a thrill to see messages from across the seas roll out of the automatic tape recorder at many times the rate before the war. In World War I, reception at 30 words a minute on an overseas circuit was considered fast.

The bulwark of all this achievement in radio communications is scientific research. An all-important center of this research is the new RCA Laboratories opened in 1942—dedicated to help win the war by giving America's fighting men the greatest resources of science, engineering and production. When peace returns, the same men of science will devote the results of their wartime research to develop new and useful products and services for the post-war era. Radio serves the nation in peace as well as in war.

THIS SAILOR IS STANDING RADIO WATCH ABOARD A U. S. BATTLESHIP.

—(Official U. S. Navy Photo.)



THE FAMED RADIO "WALKIE-TALKIE" USED BY U. S. ARMY IN THE FIELD.

—(U. S. Signal Corps Photo.)



## Electron Microscope Advances

*(continued from page 17)*

a very thin positive of the original surface. This positive was mounted on the normal specimen screen and placed in the microscope for study. This procedure was lengthy and complicated but produced excellent results. It was considerably improved by the so called Formvar replica method wherein the surface to be studied was merely dipped into a very dilute Formvar solution, stripped from the specimen and placed in the microscope for study. This simplified the process and gave good results. One of the decided advantages was the extreme strength of the film. Of recent date, a new method has been developed wherein polystyrene and silica have been utilized to form a silica replica of the surface to be studied. This process, which is as complicated as the former silver collodion method, has shown great advantage in contrast. This latter process, when photographed stereoscopically, has given remarkably good results in surface structures of all types and may well result in great new developments relating to surface studies. It will definitely permit the investigator to carry his work into realms far beyond that of the ordinary microscope not only in metals, but other bulk materials as glass, ceramics, etc.

The most interesting application of the replica process has been the use of the Formvar process for copying diffraction grating, the copy in turn being accurately calibrated by light of known wave length and then placed in the electron microscope. The resulting micrographs are then used as a standard for calibration of the magnification of the instrument. Such calibrations are easily obtainable within 2 per cent, which is far beyond accuracy ever before obtained in microscope calibration.

By far the most difficult study with the electron microscope has been that of the thin sections. Even though the instrument has a depth of focus of ten or more microns, its penetrating power operating at 60 kv. is less than one micron (1 25,000 inches). This imposes a severe restriction upon the thickness of the specimen to be studied, at the same time adding considerable complications in its preparation. Present methods of slicing thin sections, such as the microtome have been limited to a minimum thickness of one micron or more, which is beyond the maximum thickness which the instrument is able to penetrate at normal voltages of 60,000 volts or less. This has been increased by building an electron microscope that has been adapted for use with high voltages up to 300,000 volts. The penetration of matter by the electrons increases rapidly with their kinetic energy, consequently the higher voltage permits resolving details in larger objects. The high voltage instrument is not practical for the smaller laboratories so that other means had to be found for the study of thin sections. The only answer, therefore, was to find methods of producing thinner sections. This has been accomplished by mechanical improvement of the microtome. Further improvement has resulted by advances in the method of supporting the specimen to be cut, such as the latest method of using a special resin. Other methods are being improved rapidly to the point where the electron microscope will soon be as busily engaged in the field of thin sections as in other work.

The microscope was designed to fulfill all of the needs of microscopy where depth of focus and higher resolving power were the prerequisites. These factors gave us size, shape and distribution of materials under observation. With the available power supply and lenses built into the machine, it was only a small step further to designing an attachment known as the electron diffraction unit permitting the study of the crystal structure and chemistry of the surface of particles which increased the usefulness of the instrument many times.

Recently, there was formed a society called The National Conference on Electron Microscopy for the purpose of discussing and exchanging ideas on application and techniques along with the accomplishments of the electron microscope, to further this new science and art which is now growing at an amazing rate.

### Microscope Users

Users of the RCA Electron Microscope follow, in the order in which the instruments have been delivered:

1. American Cyanamid Company. 2. University of Michigan. 3. Institute of Paper Chemistry. 4. University of Illinois. 5. United States Bureau of Standards. 6. Massachusetts Institute of Technology. 7. A large Eastern Corporation. 8. Inter-Chemical Corporation. 9. Aluminum Corporation of America. 10. A Midwestern Chemical Corporation. 11. General Electric Company. 12. Eli Lilly & Company. 13. Duke University Hospital. 14. University of Pennsylvania, Johnson Foundation. 15. Celanese Corporation. 16. University of Pittsburgh. 17. Export to England. 18. RCA Laboratories, Princeton. 19. Export to England. 20. Monsanto Chemical Company. 21. Export to England. 22. Mt. Sinai Hospital, New York. 23. A Chemical Corporation. 24. Export to England. 25. Export to England. 26. B. F. Goodrich Company. 27. Carnegie Institute of Technology. 28. Export to England. 29. Export to England. 30. Republic of Guatemala 31. University of California. 32. Standard Oil Company of New Jersey. 33. United States Rubber Company. 34. A large Eastern University. 35. Westinghouse Electric and Manufacturing Company. 36. Illinois Institute of Technology. 37. Hercules Powder Company. 38. University of Missouri. 39. Export. 40. National Naval Medical Center. 41. United States Naval Research Laboratories. 42. A large Eastern University. 43. Export. 44. United States Department of Agriculture. 45. Goodyear Tire and Rubber Company. 46. New Jersey Zinc Company.

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The Blue Network finished its first year "in the black," being the first network to make a profit in its first year of operation.



GUGLIELMO MARCONI, PHOTOGRAPHED FOR THE FIRST TIME IN AMERICA ON THE YACHT "PONCE."

## REPORTING BY RADIO

*Marconi Carried Out First American Wireless Communication at 1899 Yacht Races.*

By George Clark

FORTY-THREE years ago, the first wireless communication in America was carried on, under the direction of Guglielmo Marconi, who came to this country at the request of the New York *Herald* to report by the "new communication" the international yacht races.

The yacht *Ponce* was used for the marine end of the wireless link, and its shore counterpart was a temporary installation at the Highlands of Navesink, N. J. The mast used for the antenna is still standing and, after the war, will be marked as a permanent monument.

The yacht is still in service, and its type of propulsion, the reciprocating steam engine, may be found on many other ships today, which is more than can be said of the wireless apparatus which it carried. This form of steam drive may be likened to the Marconi spark set of that early test, in that it used intermittent power, while today there are many steam-turbine installations on ships, whose smooth, continuous power is quite the equivalent of the modern vacuum-tube transmitter.

### 2 Honored by President

*(continued from page 21)*

The RCA workers were included in a group of ten production "heroes" who were honored by the President. The other eight are employees of as many different war plants throughout the country. RCA is the only plant in the group to place two winners.

To emphasize the fact that the distinction given them was without precedent in American history, the winners were guests of honor at ceremonies similar to those held for returning war heroes. For an entire day they were, in effect, guests of the Nation. Actual presentation of the citations and certificates by the President occurred at the White House.

The program also included an official luncheon with Donald Nelson, receptions, entertainment and other activities.

It was in recognition of the fact that his calipers broke a production bottleneck that Donald Nelson, Chief of the WPB, awarded the Certificate of Individual Production Merit to Crawford. The calipers make it possible to determine the wall thickness dimensions of certain castings essential to war equipment. These castings are costly and utilize critical materials.

Crawford, who is 50 years old and is a civilian fireman reserve in his home town, started with RCA in 1928 as a packer in the shipping department. He soon moved into inspection, testing and checking incoming parts and material.

Tracy started with RCA Victor in New York in 1939, in the service department. He is 31 years old and married. His father was a missionary to Turkey, and he was born in that country. While still a boy he caught the "radio bug."

Tracy's suggestion grew out of the need for speeding up testing of aircraft radio equipment. Formerly, before a plane went into action, it was necessary to disconnect all or nearly all the radio equipment, remove it from the plane, set it up in the testing equipment and put it through the tests. This required an average of eight man-hours for every plane. A relatively simple oscillator was devised by Tracy. It is set up on an air field and gets the same or better results in three minutes.

These oscillators are now installed or on their way to every American flying field, particularly those on the fighting fronts.

### Radiomarine Wins "E"

*(continued from page 10)*

"We have in our organization a crew of men and women that you can count on to give everything that is in them for the war effort. You have made us very proud to be a part of the war machinery, and we thank you from the bottom of our hearts."

Acceptance of the "E" pins was by a plant committee made up of James E. McDowell, Engineering Department; Johan G. Schott, Shop; G. P. Shandy, M.R.I. Department; Anthony Krause, Shipping Department, and Mrs. E. P. Schnabel, General Office.

John Szpak, representing the entire employee group, responded to presentation by handing Rear Admiral Watts a scroll which bore the signatures of all his co-workers to a "pledge of service in the war effort and in the cause of victory."

"We are proud that the work we have done, so far, entitles us, as individuals, to wear the Army-Navy 'E' emblem," said Szpak. "Good teamwork wins battles, both in the front lines and in the production lines. We have all of that in this happy plant.

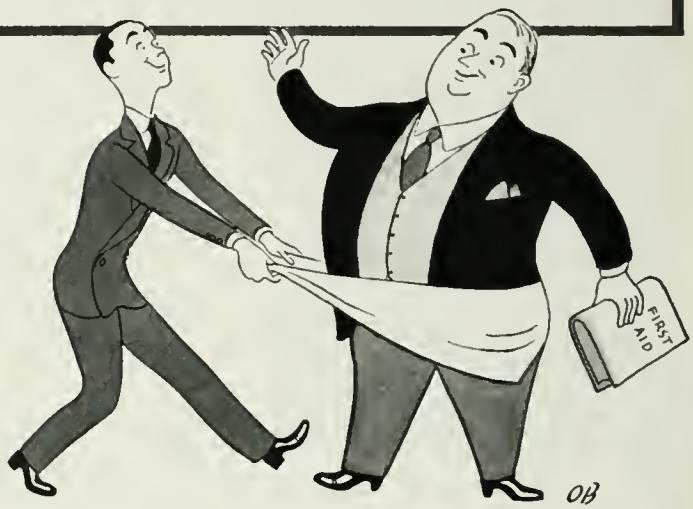
"As we look ahead we can see even greater opportunities to serve our country. We pledge our best efforts to make the most of those opportunities, and to show you later that we are entitled to the star. You may count on us to continue to be worthy of the high honor which the Army and Navy have bestowed upon us."

Miss Lucy Monroe, singing star of radio and stage, completed the ceremony by singing "The Star Spangled Banner."

# FIRST AID FOR WARTIME ADVERTISERS

## COVER THE FATTEST MARKET →

Even though your budget's short, you can still make ends meet to cover the fattest market in the U. S. Use WJZ's thrifty coverage of Greater New York. (WJZ recently pulled nearly 10,000 requests from four low-cost announcements on "The Woman of Tomorrow".)







## ← KEEP TRADE NAMES ALIVE

Keep your trade name alive for the duration by the WJZ "respiration" method. You're the one who'll be tickled. Because you'll keep that name alive and kicking in the minds of Greater New York's millions *at lower cost* over WJZ.

## FINGERS ON PULSE →

Keep your fingers on the pulse of what really counts in wartime advertising. WJZ advertising is up 37% for 1942. And there's a reason. For example, when WJZ and a competitor recently carried the same announcement 22 and 21 times respectively, WJZ pulled 20% better!





## ← KEEP MESSAGE WARM

You'll find your advertising message getting hot with the help of WJZ's *extra* coverage... 5,336,253 radio homes in the Greater New York Market—658,253 more than its closest competitor. It's the lowest cost coverage of the world's greatest market!

**WJZ** 50,000 WATTS
77 ON YOUR DIAL

**New York's First Station and Key Station of the BLUE NETWORK**




# This is a machine to help Germans remember

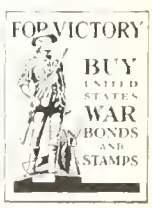
t works very simply. An American steps before it and calmly eads a script in German. Powerful short-wave transmitters eam the words to Axis Europe. That's all there is to it.

Yet to the Fascist dictators, this simple process is a thorn n their sides, a threat to their power, a danger to the uccess of their bloody schemes.

Why? Because these American short-wave broadcasts are ften devoted to waking up German memories—on a subject Der Fuehrer would prefer to be forgotten. That subject is: *What America's might and manpower will mean to he cause of the United Nations.*

Hitler wants the Germans to forget what happened in the ast war when America swung in its full strength. He wants hem to forget the boatloads of ammunition, the fleets of oldier-packed transports, the food and the weapons. He wants them to forget the Yanks ever came, because memories like that are not good for Fascist morale.

That's why American short-wave stations WRCA and WNBI are so busy nowadays giving a memory course to the German people. RCA is proud that its equipment, used by these stations, can help remind Axis-dominated Europe that America is again on the march, that America's factories are rolling out the tanks and the planes and the guns, that America's shipyards are sending out an armada of transports and freighters and battleships, that America's manpower is moving . . . moving fast . . . moving with all its might.




Yes, you Fascists who fight for Hitler, this is something to remember: the Yanks are coming—*again!*

RCA

## RCA BROADCAST EQUIPMENT



# RADIO... NERVE-CENTER OF VICTORY!

**This is a war of science.** Radio tubes add speed, precision and safety to hundreds of industrial operations, as well as to the performance of planes, ships and tanks. *Radio science is in the fight on every battlefront.*

**This is a war of mobility and speed.** Mobility on land, sea and in the air is made possible by speed of communication. *Radio carries voice, code and pictures at the speed of light.*

**This is a war of morale.** Soldiers, sailors and home folks must be informed and entertained. Understanding must be maintained with allied peoples. Courage and hope must be brought to those awaiting liberation. *Radio broadcasting builds morale.*

For more than two decades, the Radio Corporation of America has pioneered in the progressive development of radio, electronics and television. In the present crisis, those developments in communications, broadcasting, research, engineering and manufacturing are performing services of vital importance to the United Nations. Out of RCA's war experience will come new and finer products and services for industry, the home, and the nation to help make life more than ever worth living.

For outstanding achievement in the production of vital radio equipment, these awards have been given to RCA plants:




Army-Navy "E" to an RCA Instrument plant




Army-Navy "E" to an RCA Tube plant




Army-Navy "E" to the RCA Radiomarine Service

## RADIO CORPORATION OF AMERICA

**RCA LEADS THE WAY IN RADIO, ELECTRONICS, TELEVISION**

*The Services of RCA:* RCA Victor Division • R.C.A. Communications, Inc. Radiomarine Corporation of America • RCA Laboratories • National Broadcasting Co., Inc. Blue Network Co., Inc. • RCA Institutes, Inc.

*BUY WAR BONDS EVERY PAYDAY*

# RADIO AGE

RESEARCH · MANUFACTURING · COMMUNICATIONS · BROADCASTING



APRIL

1943



# ALTITUDE: 40,000 FEET

Inside this new RCA plastic altitude chamber, aircraft radio equipment is taking a ride at 40,000 feet. As the pressure drops inside the sealed, transparent walls, expert eyes observe every part of the radio mechanism. Defects in design, details of faulty construction that would remain hidden until actual high-altitude flights, can be noticed at a glance *right on the ground*—and corrected *before* the radio is installed in a plane.

For pilots it means greater safety, better performance, *dependability*—where failure of the radio equipment might mean difficulty for a courageous crew.

RCA's new all-plastic test chamber represents another step forward in aviation radio research. Because it is entirely transparent—it enables engineers to study the *whole* set at once, to check for high altitude flash-overs and leaks at the same time, to look for tuning shifts and "breathing" parts in the set simultaneously.

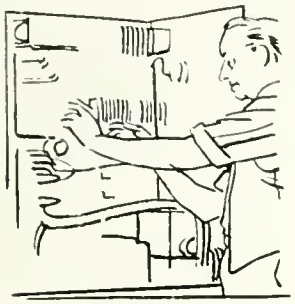
This most advanced of high-altitude test chambers is typical of RCA's many facilities for aviation radio research. Today that research has but one goal—to help make America's armed might in the air the most powerful and effective flying force in the world. From that war-time research will come the knowledge, the skills, and the technique that will help *keep* America's wings the mightiest and most useful known to man.

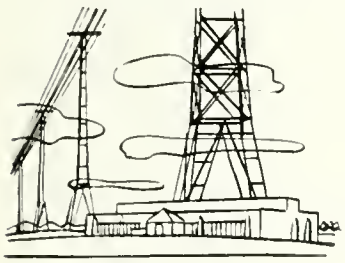


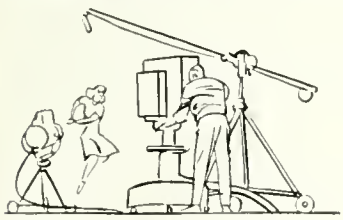

## RCA AVIATION RADIO

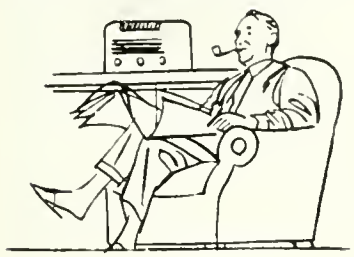
RCA Victor Division • **RADIO CORPORATION OF AMERICA** • Camden, N. J.











COVER—This striking photograph made by Ray Hutchens of R. C. A. Communications, Inc., shows one of the long-wave antenna towers, used with Alexanderson alternators, at RCAC's Rocky Point, L. I., station.



# RADIO AGE

RESEARCH · MANUFACTURING · COMMUNICATIONS · BROADCASTING

VOLUME 2 NUMBER 3
APRIL 1943

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RESULTS OF WAR-TIME RESEARCH IN RCA LABORATORIES, PRINCETON, N. J., ARE POINTING TO NEW RADIO-ELECTRONIC SERVICES IN PEACETIME. HERE, A. P. SCHAEFFER OF THE LABORATORIES STAFF REMOVES DEVELOPMENTAL TUBES PARTS FROM A HYDROGEN ATMOSPHERE FURNACE AFTER FIRING.

# Radio Research Points to Future

WAR-TIME WORK IN RCA LABORATORIES AT PRINCETON ENABLES SCIENTISTS TO ENVISAGE NEW RADIO-ELECTRONIC SERVICES FOR ALL MEANS OF TRANSPORTATION AND MOBILITY



By E. W. Engstrom

*Director,*
*RCA Laboratories, Princeton, N. J.*

IN THIS war, much reliance has been placed upon scientific accomplishments. The span from research conception, through embodiment into instruments of war and production for mass use at the battlefront, has been shortened. The pressure is constant to provide some unique and useful tool of warfare. It is natural then that we have several "battlefronts" — research, as one, with the several stages which follow.

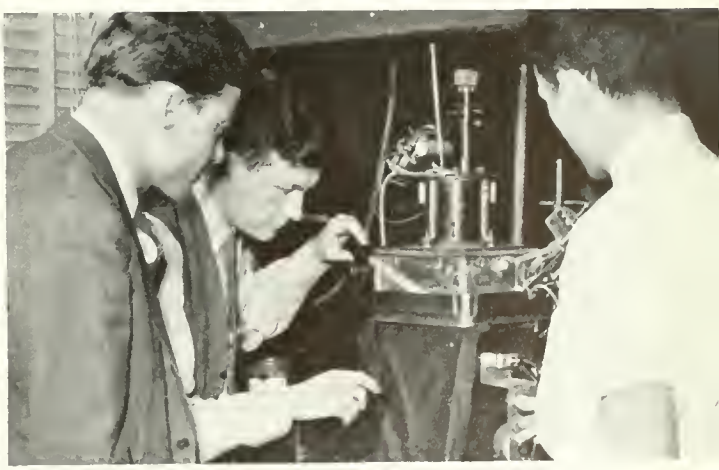
In research, we are matching our resources against those of our enemies. There is now ample evidence to know that we are steadily and surely on the "offensive." Among the United Nations, there has emerged a gigantic research program, relentlessly working on the home front, creating tools to outsee, out-hear, out-wit, out-shoot and out-fight our enemies. In this effort, the industrial research laboratory has, and is doing, an outstanding job. Good as the job has been, a larger job remains to be done and research for this is now pressing forward.

Much of this research activity has centered in fields of radio, electronics and acoustics. This has been called a radio war. Surely radio and its closely allied fields have a most important part in the planning and actions. Radio and its manifold uses can determine the outcome of an encounter. It ranks, in importance, with fire power against the enemy. As we look back at our peace-time research in radio for communication and entertainment, in television, in facsimile, in electronics, in acoustics and in the multiplicity of the newer offsprings of radio, it may be seen that the conversion to war purposes was in some instances direct application and in others application of techniques. These projects and techniques all, with certainty and resolution, did march to war.

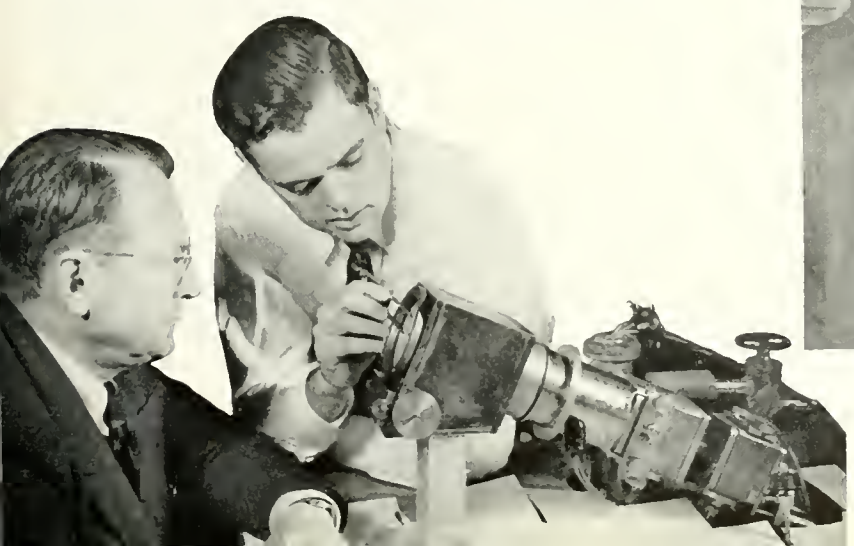
During peace-time, RCA kept the Army and Navy advised of research having possible military applications. A change-over in objectives for RCA research toward war uses began during 1939. The change-over gained impetus during 1940. By 1941, the major effort was toward war projects and late that year was all toward that end. With thinking directed to possible military uses, as our peace-time research progressed, the conversion to an all-war program was direct and effective.

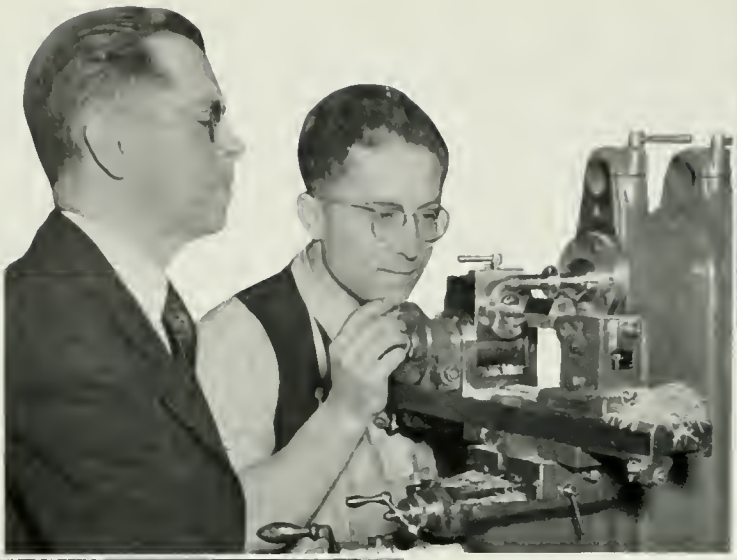
War increased tremendously the research efforts in a variety of fields. This has been brought about through expansion of existing laboratories and establishment of new laboratory groups. When the "will it aid in the war?" test is applied, it is natural to expect emphasis to fall into more restricted classifications than during a peace-time program. Again, with pressure being

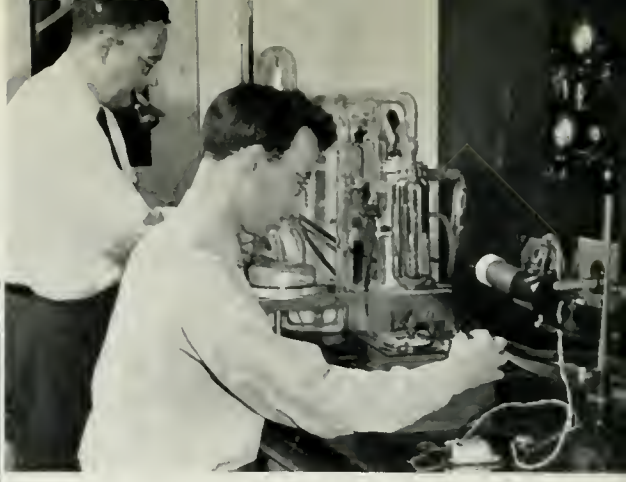
THESE THREE RCA SCIENTISTS, B. J. THOMPSON, DR. F. H. NICOLL, AND F. E. WILLIAMS DISCUSS SET-UP USED IN TREATING GLASS TO MAKE IT NON-REFLECTING.



DR. V. K. ZWORYKIN (LEFT) AND DR. JAMES HILLIER AT WORK ON THE DESK-SIZE RCA ELECTRON MICROSCOPE, WHICH IS EXPECTED TO BE IN GENERAL USE SOON AFTER THE WAR.





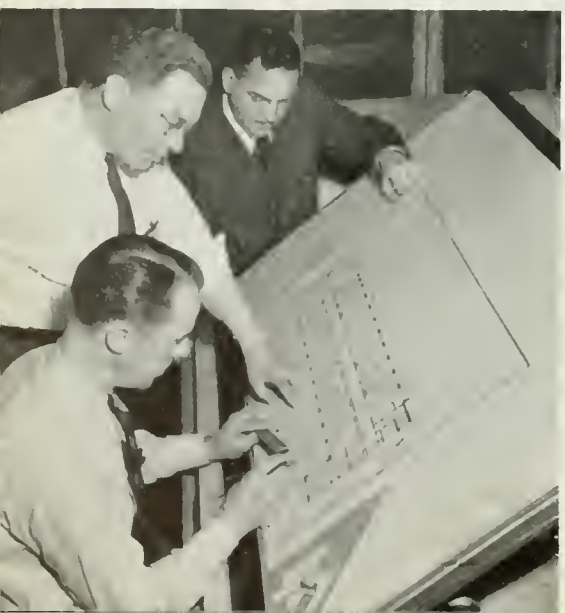


A DEMOUNTABLE VACUUM SYSTEM IS BEING USED AT RCA LABORATORIES BY DR. G. H. MORTON AND R. R. GOODRICH IN THE STUDY OF AN ELECTRONIC PROBLEM.

IN THE MODEL SHOP AT PRINCETON, SCIENTISTS SEE MANY OF THEIR IDEAS TAKE PHYSICAL FORM, F. L. CREAGER AND J. R. DUNPHY CHECK ON A MILLING MACHINE OPERATION.



DR. R. R. LAW (LEFT) AND J. E. MC COOL PREPARE THE GLASS PARTS OF A HIGH-SPEED MERCURY PUMP FOR USE IN WORKING OUT A RESEARCH PROBLEM.



F. E. GRESWOLD, J. J. MC NEILL, AND L. MAC CLASKEY WORK AT THE DRAFTING TABLE TO SOLVE A LABORATORY LAYOUT PROBLEM.

applied toward useful results in the shortest possible time, some of the completeness and finesse of a normal research schedule may be short-circuited. What might take years is compressed into months for many projects and this is as it should be during war. Individuals doing research and research organizations have been quick to see the need and have responded to the challenge with a determination that presages success in advance of the final accounting.

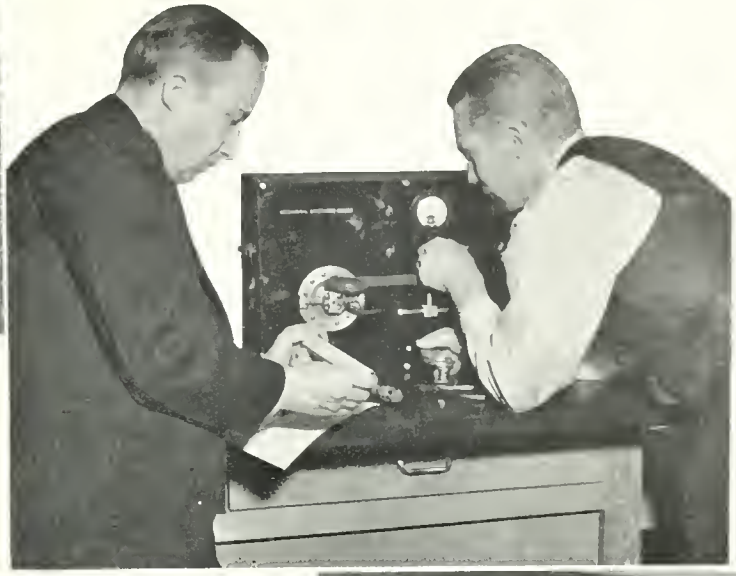
Application of continuing research is all to war projects. Peacetime services continue essentially status quo or are completely arrested and set aside. We look forward to the day when our war job will be done and we may again direct our research to direct benefits of mankind. Today, we can but plan and visualize that which we will do tomorrow. Just as surely as research is important and necessary in the prosecution of the war, so will the present increased program of research be important and necessary when converted to new objectives in the working out of the peace.

Radio, in the past, has been a means of transmitting speech and other intelligence from point-to-point or broadcast. As a means of control and of navigation, its uses have been restricted. Just before the war research in very short waves (radio) was pointing the way to many specialized uses. After this war, the practical applications of these results will expand quickly to all means of transportation and movement. Aeroplanes, ships and ground vehicles will "see" in all weather conditions and tracks for their movements will be "rails and channels" of radio. Planes, ships, motor vehicles, etc., may come and go in safety without regard to weather, obstacles or possibility of collision — radio and electronics, through their broad realm of application, will make this possible.

Electronics will rapidly assume new roles—some now clearly known and others scarcely visualized. We will count and compute by electronic methods. We will see by visible and invisible light; through electronics, things near at hand or far away, things possible to view by eye and things impossible to view directly, or by any means known in the past, will be made visible to man. The electron microscope is an example of the power and promise of electronics. Just as the electron microscope opened new frontiers in fields



AS MISS E. C. FOWLER (BACKGROUND) ASSEMBLES SPECIAL TURE STRUCTURES, E. W. HEROLD AND MISS J. V. TRUSKA DISCUSS A TUBE CONSTRUCTION PRORLEM.



USING A NEWLY DEVELOPED DEVICE KNOWN AS A MECHANICAL IMPEDANCE BRIDGE, DR. H. F. OLSON AND A. M. WIGGINS TEST AN ELECTRO-MAGNETIC MECHANISM.

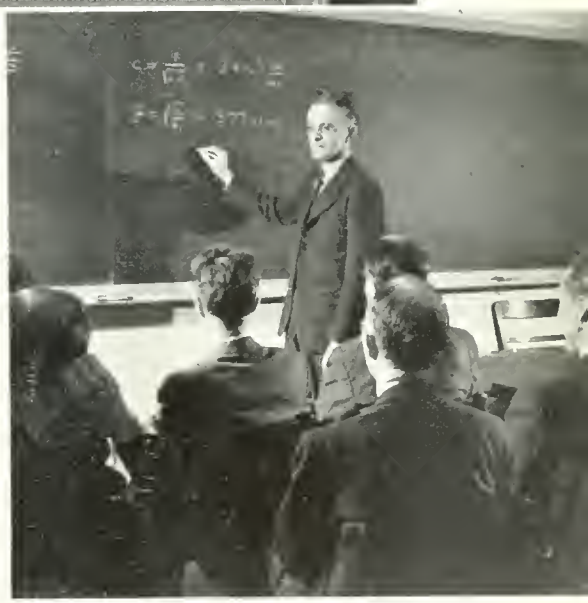
of medicine, biology and industrial research, so will electronics open many doors in the future. We shall measure, control and process better through the use of electronic methods in the home, the laboratory and the factory. The future will be studded with a myriad of electronic jewels.

Radio tubes to generate power at radio frequencies have been used mainly at sources for radiating signals through space. Power for manufacturing processes has been reserved for the low alternating currents. Research has shown, and industry now realizes, that alternating current at radio frequencies has unique advantages for many services and performs in many ways not attainable by older methods. Thus, generators of radio frequency will take their places in the factory, in the field and even in the home, to heat and to effect various reactions and changes. Such uses will shortly place much more radio-type power in industry than in all radio communication and broadcasting.

We entered the war with broadcasting at the ultra-high frequency channels and television taking their first steps along the road to public service. These, television particularly, are needed in the post-war period to spur on and to sustain progress and employment. The knowledge gained through years of television research was most helpful in other fields of development for instruments of war; therefore, it is to be expected that war-work will indirectly add to television knowledge and techniques. Because of this, we will be able more readily to add sight to sound, as a radio service.

Thus, while we are driving forward with our war-work, we do have our thoughts on the day ahead, when the war clouds will roll away and we can again undertake the work of our desires. We are conscious of the potentialities of the products and services to come from the researches, now inactive, which will be prime objectives "tomorrow." We dream of the contributions that will be made in the fields of science, culture and just ordinary living, convinced that radio, electronics and acoustics will have an important part. These, and others, are the things that will take form in our research workshop after the war.

Men of science, doing research, like to think of the results of their work as benefits, as progress, as



SCIENTISTS GO TO SCHOOL, TOO. DR. W. D. HERSHBERGER REVIEWS MAXWELL'S EQUATIONS FOR ENGINEERS WORKING WITH WAVE GUIDES AND OTHER TECHNIQUES.

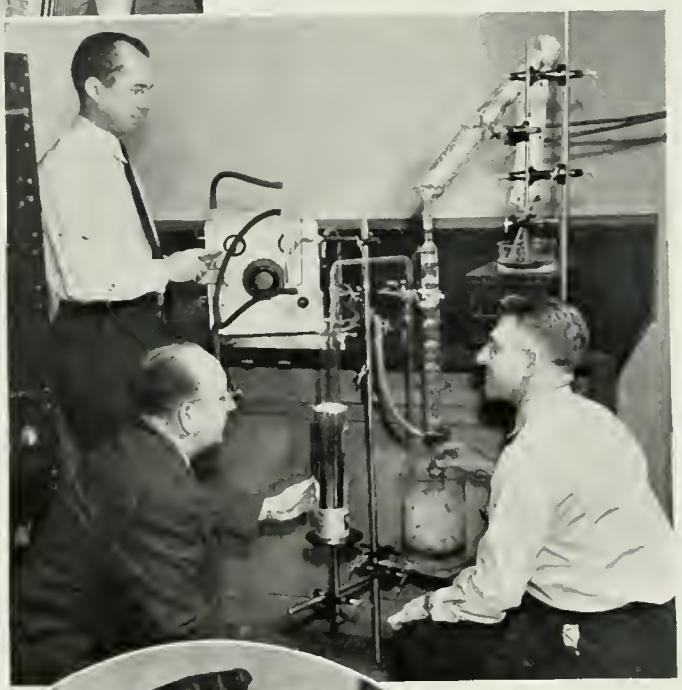


CIRCUITS RESEMBLING THOSE USED IN TELEVISION EQUIPMENT BEING TESTED BY R. D. KELL AND T. L. GOTTIER.



H. G. GREIG (SEATED) AND C. J. YOUNG TEST ELECTRO-CHEMICALLY PRODUCED COLORS FOR USE WITH RADIO FACSIMILE EQUIPMENT AT PRINCETON.

THIS INVOLVED-LOOKING EQUIPMENT IS BEING SET UP BY H. W. LEVERENZ, DR. G. H. BROWN, AND C. N. HOYLER TO UTILIZE RADIO-FREQUENCY POWER IN INDUSTRIAL CHEMICAL PROCESSES.



things of permanent value to health, to living, to work, to entertainment. Research means change — and to change, without setting in motion sequences of unfavorable results and reactions, requires profound thinking and planning. We realize, during time of war, that all has not been well. For one thing, scientific research for several decades has moved along with ever increasing speed but the sociological aspects have lagged and, as a result, the impacts of new advances and resulting changes have not always been beneficial. We are now in the stage of this war where our thoughts are clearing and where we see the road more certainly. We are at the stage where some are thinking of post-war plans and actions. Research and the changes brought about by research should loom large in this thinking.

We in RCA have much to contribute. We have much of promise to offer to our generation and to pass on to future generations. Research has grown stronger during stress of war. Research can and will continue strong along the road to peace and in the time of peace to follow. The United States and the world need strong scientific research, and a dynamic determination is required to see that the results are applied to the benefit of peoples everywhere. This is both a promise for research and a challenge to research. Now is the time to begin the thinking that will lead to plans and actions for the future.

FROM THIS HIGH-TEMPERATURE FURNACE USED IN METALLURGICAL INVESTIGATIONS OF RADIO CIRCUIT COMPONENTS, C. WENTWORTH AND W. L. CARLSON PREPARE TO REMOVE A TEST SAMPLE.



WITH SLIDE-RULE AND REFERENCE BOOK, INSTEAD OF TUBES AND CIRCUITS, R. S. HOLMES AND DR. I. WOLFF PLAN AN ATTACK ON A RADIO PROBLEM.



# Women In War Jobs

## RCA VICTOR, WITH PURDUE UNIVERSITY COOPERATING, TO TRAIN GIRL TECHNICIANS AS NEED FOR WOMEN WORKERS GROWS



By F. H. Kirkpatrick

*Personnel Planning and Research, RCA Victor Division*

THAT "infinite variety" of which the poet sang concerning women is being demonstrated anew in a rather startling way by the experience of war production industries in the employment of women at work they have never done before. This hiring has been going on apace for the last year. Up to a short time ago it was on a more or less limited basis, created by the growing man-power shortage. Now the Government tells us that even more woman-power must be employed and that by the end of 1943 we shall have 18,000,000 women in jobs in all industries.

Anticipating this, the RCA Victor Division some months ago initiated a carefully planned, comprehensive program to expand its already considerable force of women workers. While this stepping-up of the proportion of women workers grows out of the war situation, the employment of women represents no change in company policy. In the Harrison plant, for instance, women made up 69 percent of all employees as long ago as 1937. Plans for the employment and training of additional women workers, then, relate to their use in increasing proportions throughout all plants, and in job classifications entirely new to women. These plans are now in full swing at all six plants of the company: Camden, Harrison, N. J., Lancaster, Penn., Bloomington and Indianapolis, Indiana, and Hollywood, Calif., with variations to fit the different conditions at each plant.

Perhaps our most ambitious program is now in the course of organization. This program is designed to supply us with a force of trained women radio technicians and is being carried out in cooperation with Purdue University in Indiana. The plan calls for a group of eighty girls, between the ages of 18 and 22, to study at Purdue with the curriculum "custom-built" for RCA.

The intensive program at Purdue provides for two terms of twenty-two weeks each. There will be forty hours a week of classroom work or supervised study. At the completion of the course, the girls will be qualified for immediate assignment in our plants for quality control work and as Engineering Aides. The girls will be selected from our own plants and from colleges and universities. Considered employees-in-training, they will be paid a salary while attending school in addition to having their university expenses paid.

### *Unsuspected Skills*

The training activities in operation at our plants, though only in its early stages, have turned up abundant evidence that there were many things industry didn't know about women. One of these things is that they have a world of heretofore unsuspected skills, constituting a storehouse of producing power on which we have hardly started to draw. Among these skills are the ability to do exacting tasks, such as working to very close tolerances. With their delicate sense of touch and supple wrists, they also assemble tiny parts with infinite care, undismayed by the monotony of the work. These characteristics are of primary importance now, when the nation is at war and must put forth the maximum of its energies to win in the shortest possible space of time. But another discovery has been made of even greater importance in the long run, not only to women, but to the national welfare. This is that women can contribute a great deal to industry in supervisory capacities hitherto denied them, as well as in ideas to improve manufacturing techniques.



MISS FRANCES R. WHITNEY, WHO HAS JOINED RCA VICTOR DIVISION AS CONSULTANT AND ADVISOR ON THE PERSONNEL PLANNING AND RESEARCH STAFF.

The career woman, in other words, is no longer to be monopolized by the professions. There is a place for her in the shops as well as in the offices of industry. There is no limiting "top" to the responsible job open to her. In RCA Victor, as a matter of fact, she is being encouraged in this direction by a systematic upgrading process. Every woman employee is eligible for aptitude tests and personnel analysis. If this shows she might do better at something other than her present job, she is given intensive special training and put to work at the new task.

As a consequence of this, many girls who were doing clerical and stenographic work in the offices a



MISS HELEN BIRCHER (RIGHT), EMPLOYMENT MANAGER AT RCA VICTOR'S HARRISON, N. J., PLANT, INTERVIEWS WOMAN JOB APPLICANT.





MISS MAXINE JACKSON (LEFT) CONDUCTS "VESTIBULE TRAINING" AT RCA'S BLOOMINGTON, IND., PLANT; MISS KAY JOHNSON, ONCE ON THE ASSEMBLY LINE, NOW IS AN INSTRUCTOR FOR GIRL WORKERS AT CAMDEN, N. J.

few months ago are now doing machine operating, sorting, checking or inspection work in the shops. Many others who were operators have become supervisors, forewomen or group leaders. It is likely that this trend will go on in many other directions.

One girl who has recently completed the advanced plant course in radio theory and production looks forward to using that training as a background for radio engineering. She was hired as a repair operator, and after seven months' experience, became a group leader. An assistant foreman in a division engaged in the final assembly of important war equipment is a girl who completed successfully, in the same plant, both the elementary and advanced radio courses.

In a number of instances, women such as these are directing the work of men, and doing it so diplomatically and so well that there has been no resentment. Conversely, many women have been taken from shop benches and machines into research, engineering, educational and personnel work.

In this process, RCA Victor has set up natural ability and personal efficiency as the "selecting screen." At the Bloomington plant, 20-year-old Maxine E. Jackson is conducting "vestibule" training classes in the plant's educational program directed by E. H. Cooper. She came to RCA Victor fresh from high school in 1940, was made an inspector four months later, a group leader in another four months, and was advanced to her present post in 1942. Another woman without formal college training—Miss Helen Bircher—is Employment Manager at the RCA Victor Harrison plant; she started as a factory worker. The Employment Manager at Bloomington also is a woman, Miss Mary Frances Roll. She is a graduate of Indiana University and has taken extension courses in personnel work.

### *Self-made Women*

The foregoing shows that a college education is not absolutely essential in the new world of achievement opening up for women. But this is not to imply that collegiate training has lost any of its unquestioned value. The Senior Interviewer at the RCA Victor Lancaster plant, Miss Mary Margaret Rupp, has done outstanding work in the world of music and education, with post-graduate courses to her credit at Duke and Syracuse Universities. She introduced music courses to the public schools of Pennsylvania, had much to do with the National Youth Administration in the same State and was an interviewer for the United States Employment Service before joining RCA Victor. The Senior Interviewers at Indianapolis are all girls and they come from such universities as Butler, Purdue, Indiana, and Columbia.

These instances are cited not because they are outstanding, but for the reason that the women referred to sought out for themselves the initial employment with the company leading to their present posts. Insofar as these posts are concerned, they are literally, "self-made women." The point is that the company has now organized procedure to find, employ and train women with equal, but heretofore latent, aptitudes. It is to be naturally expected, therefore, that the next year should show a large increase in the number of "career" women in the RCA Victor Division, and in the importance of their work.

As more and more men leave the company for the armed services, supervisory positions will of necessity become vacant. On the basis of British experience, the company will make no mistake in replacing men with women in first-line supervisory positions. Such women must, of course, be selected on the basis of their technical qualifications and their capacity for leadership. They must have demonstrated both of these qualities as RCA employees.

If RCA Victor consistently uses appropriate tools in the selection and placement of its employees, women with a variety of aptitudes and capacities will be available, as needed, for a variety of jobs. Job analysis is one of the most important of these tools. All jobs must be analyzed by persons competent to describe them in detail, if the qualifications of individuals are to be fitted to the requirements of the

job. In order to match the two, the personal specifications setting forth the duties of the job must be as complete as the job analysis.

No matter how carefully women are selected, we may fail to make maximum use of them unless we remember two other points. Men and women differ not only in muscular strength, but also in emotional and social attitudes. Women also differ from men in that they have had less industrial experience than men, and have, therefore, a lack of mechanical familiarity—not necessarily less mechanical ability than men. The supervisor who recognizes and allows for the natural characteristics of women, at the same time carefully observing the quality of their job performance, is the one who will find his increased force of women employees most valuable.

As evidence of the company's definite interest in using womanpower most effectively, Miss Frances R. Whitney has been added to the staff of the Division of Personnel Planning and Research. Her definite responsibility will be that of serving as consultant and advisor to plant managers, personnel directors and others on personnel relations, skill utilization and training methods for women. Miss Whitney has had a rich experience in employment, training, and research fields. She is a graduate of Mount Holyoke.

It might be noted that in the eleven-month period ending late last year, prior to the full-swing inauguration of the present educational program, the number of women employees at all RCA Victor plants increased from approximately 10,000 to more than 13,500. That increase came about through routine methods of employment: help wanted ads, the United States Employment Service, recommendations by present employees and similarly obvious channels.

Now the intensive training courses are being supplied by a well-planned employment department search for available women, reaching out among high school graduates, the Y.W.C.A., women's clubs, churches and related organizations. Assuming an increasing shortage of man-power, it is more than likely that the rate of employment of women workers also will increase.

### *Vestibule Training Used*

More than two-thirds of all the employees at the Harrison plant are women, and, since they are particularly fitted for the work of radio tube making performed there, that percentage may also be expected to increase. It was at Harrison, incidentally, that RCA Victor first instituted "vestibule training." As the name implies, this is designed to point the applicant to many doors of opportunity and to shorten the time between initial employment and full productive capacity. Though statistics are not yet available, there is plenty of evidence that a tremendous savings of time already has been made, and this will increase with experience. Vestibule training is also being used at the Bloomington plant.

Some industrialists have been apprehensive—and many still may be—that the presence of women in the shops would reduce the efficiency of the male workers, either by distracting their attention or stirring up resentment. The experience of RCA Victor has been directly to the contrary, when the women are properly placed. A woman at a task she likes adds to her initial patriotic enthusiasm a power of concentration that in many instances acts as an incentive to the men. This spirit of patriotism also is a potential inspirational force. A man working in the same shop as a woman with sons and perhaps grandsons in the services, or a boy friend in the Marines, is not likely to feel like taking it easy.

There are certain other contributions women workers make as operators in the shops, other than their output. As a rule their benches are likely to be cleaner, and more neat and orderly, than those occupied by men. This makes for higher efficiency, because it helps reduce lost motion in looking for tools and parts which are not in their proper places.

That women, by and large, have less physical strength than men is a recognized fact. It has been found, however, that engineering adjustments made to offset this factor have at times made possible an increase in production by male employees engaged on similar operations. Such adjustments have also reduced accident rates, thus proving of double benefit to the department's production record.

All in all, women in industry are more than measuring up to their job standards; they are even setting new high standards in spirit, skill and efficiency. RCA Victor welcomes them.







ALL THROUGH THE RCA VICTOR ORGANIZATION, AS MORE MEN ENTER THE ARMED SERVICES, WOMEN ARE BEING GIVEN NEW RESPONSIBILITIES. MISS LUCY GRACICK (LEFT) SUPERVISES A GROUP OF TWENTY GIRLS AT CAMDEN; MISS MARY FRANCES ROLL (CENTER) IS EMPLOYMENT MANAGER AT BLOOMINGTON, AND MISS MARY M. RUPP IS SENIOR INTERVIEWER AT LANCASTER, PENN.

# Adventure On The Air

## BLUE NETWORK ADOPTS CODE OF PROGRAM STANDARDS FOR CHILDREN—BROADCASTS ARE POPULAR IN AMERICAN HOMES



By H. B. Summers

*Manager, Public Service Division, Blue Network Company*

THE modern "Children's Hour," daily diet of juvenile adventure broadcasts, has become a popular institution in thousands of American homes.

In the minds of the listening layman, adventure serials are a certainty for better or worse. To those experienced in radio programming, who have nursed these series through their adolescent years, they are an institution representing constructive entertainment.

In building its adventure programs, the Blue Network, which carries a heavy schedule of children's serials, has tried to find an acceptable balance between wholesome stimulation and instruction.

Working with the knowledge that adventure stories in themselves are not frowned upon by educators for the juvenile mind, the Blue has eliminated the recognized evils from its children's serials and has adopted a workable code of program standards.

Education, as such, we have found is resented by the child who expects entertainment and thrills in his radio dialing. Adventure, however, peppered with interesting facts, constructive ideas, and educational suggestions, is a sugar-coated pill for which American children cry.

"Jack Armstrong—All American Boy," for instance, shows the advantage of a knowledge of science and mathematics as well as giving the young listener a role to play in his nation's war effort. Through the "Write a Fighter Corps," youngsters are urged to write to a relative or acquaintance in the armed forces.

"Hop Harrigan," aviation kid show, highlights the importance of many courses now being taught in school to prepare the child for a career in aviation. The popular masked rider of the airwaves, "The Lone Ranger," invites his listeners to join the Lone Ranger Victory Corps which is dedicated to Victory, Responsibility, Citizenship, Safety and Health.

Again, the "Jack Armstrong" program retains a world-famed child psychologist to check every script of the series, to make sure of its healthful influence on young minds.

### *War Angles Developed*

"Captain Midnight" emphasizes the importance of flying and naval activities.

"The Sea Hound," truly adventurous series, endeavors to teach the language, geography, and the customs of South America. In some schools, teachers are using the serial as required listening.

"Terry and the Pirates" has its locale in wartime China and both the setting and characterization are pointed toward increasing our understanding of Chinese life and deepening our sympathy with China's present struggle. Factual information used in the series is obtained from Government news agencies both of this country and of China.

Latest adventure series to join the Blue lineup of children's programs, "Dick Tracy" is teaching youngsters the dangers of black markets. The world famous detective, featured as the "hunter of evil men," is showing, through adventure episodes, that crime never pays.



JANICE GILBERT ENCOUNTERS ALL KINDS OF ADVENTURE IN THE BLUE NETWORK SERIES, "THE SEA HOUND."

Since Pearl Harbor, children's programs have been tuned to the war effort. Today's children are interested in the war news. They read newspaper headlines and hear the war discussed at the dinner table. They know our enemies are the Japanese and Germans and they know, better than a great many adults, the heroic exploits of members of the Army, Navy, Marine and Air Corps.

Almost all our children's serials deal with some phase of the war. Program builders have realized that herein lies a wonderful opportunity to do a good job of education and morale-building. The Blue is in daily contact with the public relations offices of the Army, the Navy, and the Office of the Coordinator of Inter-American affairs.

These offices know the great majority of children's programs stress the war and are sympathetic with this additional way to build up among the youth of America respect and admiration for the Amer-



CHESTER STRATTON PLAYS THE TITLE ROLE IN "HOP HARRIGAN," A SERIES ABOUT A YOUNG U. S. AVIATOR, WHO GETS IN MANY DIFFICULT SITUATIONS.

ican way of life and confidence in our fighting forces.

Obviously, in our over-all picture of children's programs, all stories must reflect respect for law and order, good morals and clean living, the importance of fair play and honorable behavior.

The modern "Children's Hour" has grown up during the past decade. Today's programs differ sharply from the type of children's thriller which first began the adventure trend. Sloppy writing and inadequate research on children's programs belong to the past and sponsors themselves were the first to recognize and correct the condition.

We know most boys and girls are voracious listeners to radio, listening during their leisure time an average of three or four hours a day. Particularly in the case of young children, radio listening is a very intense activity with the youngster following the adventures of his favorite hero or heroine with rapt attention.

Educators and students of broadcasting agree that radio is one of the strongest influences in shaping the thoughts and attitudes and the entire personalities of boys and girls of school age.

The Blue Network is fully aware of the influence exerted by radio on children. Naturally, the network's Program Department takes every care to insure that programs are not over-stimulating to young children, and that nothing is broadcast which might have a harmful effect upon young listeners.

Because of its particular obligations to its juvenile audience, the Blue reserves the right of meticulous supervision over all programs appealing to children. Certain policies, in addition to those applicable to all programs, have been established to govern the acceptance of these children's shows.

### *Ban on Supernatural*

In order that children will not be emotionally upset, no program or episode may end with an incident which will create in their minds morbid suspense, or hysteria. Dramatic action may not be over-accentuated through gunplay or other methods of violence. In general, children are more credulous than adults, therefore use of the supernatural or of superstition likely to arouse fear is not permitted.

Torture or horror of any kind may not be portrayed or suggested. Vulgarity and language of rough character is not acceptable and sound effects intended to anticipate or stimulate any of these prohibitions may not be used.

These taboos, however, are only part of the story. Following the premise that children listen to programs and are influenced by what they hear, the Blue does not stop at the restriction of negative or harmful suggestions in its adventure serials.

The Blue Network works on the policy of using its programs for boys and girls as a means of giving information, creating understandings and developing desirable attitudes. A large number of our programs, therefore, are directly planned to serve an education purpose, without the child being aware of the design. We are building our adventure programs with the idea of giving the listener a broader knowledge and of creating wholesome attitudes through the guise of entertainment.

CHARLES FLYNN AND SARAJANE WELLS, CAST IN THE "JACK ARMSTRONG" SERIES, CONTINUALLY MATCH THEIR YOUNG WITS AGAINST NAZI AGENTS.



# Old Tubes Made New

## RCA VICTOR ENGINEERS REBUILD TRANSMITTER POWER TUBES TO AID BROADCASTERS DURING REPLACEMENT SHORTAGE



By L. W. Teegarden

*Manager, Tube and Equipment Dept., RCA Victor Division*

EARLY in 1942, studies made by the radio industry indicated that 60 to 70 per cent of the nation's broadcast stations might be driven off the air unless renewal tubes were made available to them. Helping to keep broadcast stations on the air in the face of a threat of silence for lack of replacement tubes is the part played by RCA Victor Division engineers.

The tube and equipment department met the emergency on two fronts. The first front was devoted to obtaining from amateur operators, already silenced by the war, the power tubes no longer in use. The second front tackled the problem of salvaging the larger types of power tubes through a rebuilding program.

### *Salvage Larger Types*

In a program to obtain the maximum life of tubes still in service, an advertising campaign was directed to broadcasters.

One of these advertisements, addressed directly to amateurs, suggested that they sell their idle transmitting tubes to their nearest RCA tube distributors thus making them available to commercial broadcasters. This was followed by a broadcasting trade advertisement suggesting that stations contact RCA tube distributors regarding the availability of such tubes.

As a consequence of this campaign, hundreds of tubes owned by amateurs began to pour into the hands of RCA distributors and became available for broadcasters. Some had never been used. But, in a spirit of patriotism, their "ham" owners brought them in to RCA distributors as a contribution to the war effort. A number of operators wrote directly to the company describing what tubes they had for sale. A list of these offerings was sent to RCA tube distributors and broadcast stations.

Meanwhile, RCA engineers were attacking the problem of salvaging larger types of tubes, which use substantial quantities of critical materials, through rebuilding. The rebuilding program does not justify itself in times of peace, when materials now critical are plentiful and relatively cheap. It calls for complete dismantling of tubes returned by the broadcasters after the tubes were worn out electrically but not mechanically. The usable parts of such tubes, together with small amounts of necessary new material, were then put through the company's regular manufacturing processes of assembly, aging and testing.

All of that sounds simple, but what it called for was a reversal of the assembly line procedure, in taking the old tubes apart, and the development of new techniques in rebuilding them. It was a reclamation program that could not be conducted on an individual basis. In other words, it called for a pooling of old tubes. In the rebuilding process the parts of each single tube lost its identity. The one the broadcaster got back might contain parts from any others.



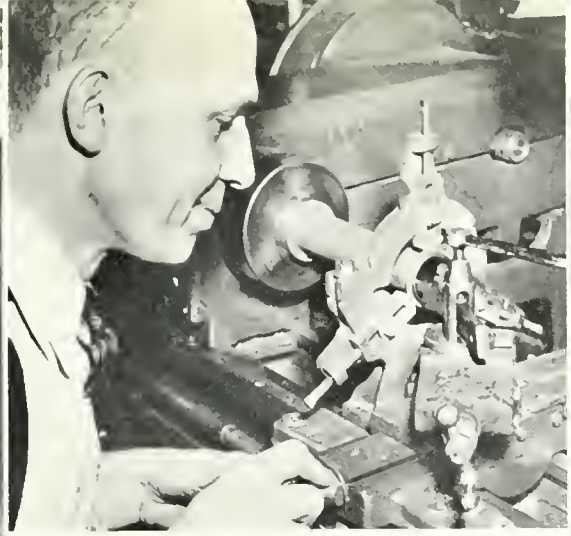
THE FIRST STEP IN REBUILDING AN INOPERATIVE POWER TUBE IS TO CUT OPEN THE GLASS BULB, AS SHOWN HERE.

One of the most difficult parts of the job, of course, was getting the materials. Speed was essential, but the work could not be hurried. As a first step, for example, the broadcasting station had to obtain a preference rating to accompany the return of an old tube and his order for a rebuilt one. Since radio tubes contain quantities of copper, tungsten, molybdenum, nickel and other metals now obtainable only on WPB priorities, all orders were contingent on the amount of material thus obtainable. After all these problems had been solved, the tubes had to be tested to make certain that they would stand up under actual service. These tubes were tested over a period of months in RCA services to insure that rebuilt tubes would give good service.

### *Keep Stations On Air*

All of this took time, but patience and skill triumphed and, early last Fall, RCA Victor was able to notify broadcasting stations that it was ready to help keep them on the air with rebuilt tubes of types listed. It might be noted here that in many instances the station sending in its order was reduced to a single spare tube before the failure that made the order necessary. If the rebuilt tube had not been available and the







INSTALLING THE GRID STRUCTURE OVER THE FILAMENT (LEFT) IS A PART OF THE TUBE REBUILDING PROCESS; THEN COMES THE PREPARATION OF THE COPPER ANODE TO WHICH THE GLASS BULB IS TO BE SEALED (CENTER), AND THE ACTUAL SEALING (RIGHT) OF BULB AND ANODE.

spare failed, the station would have been silenced. In that event, since these were all relatively large stations, hundreds of thousands of American homes would have been deprived of their daily radio programs.

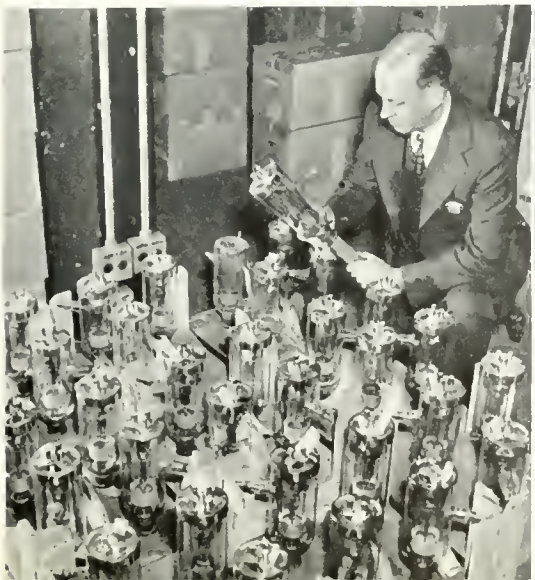
Rebuilding is still available and will no doubt continue to be of service in keeping the airlanes open for the duration. Every time a large tube is rebuilt it puts that much more critical material into the stockpile for use in the manufacture of new tubes, both transmitting and receiving, for military needs.



THIS GIRL OPERATOR INSERTS THE REBUILT MOUNT, OR INTERNAL STRUCTURE, INTO THE BULB-ANODE ASSEMBLY.



LOWER RIGHT—HELD IN A LATHE, THE MOUNT IS SEALED IN THE BULB-ANODE ASSEMBLY AS ONE OF THE FINAL OPERATIONS IN REBUILDING A TUBE.



BOTTOM — THE JOB OF REBUILDING THEM COMPLETED, A GROUP OF TUBES ARE MADE READY FOR PACKING AND SHIPPING TO BROADCASTING STATIONS.

# Radio Adds to Story of Religion

WITH LARGE PART OF WORLD AFFECTED BY WAR, AMERICAN RELIGIOUS BROADCASTS BECOME A CHIEF MEANS OF UPHOLDING FREEDOM OF WORSHIP IN MANY COUNTRIES



By Dr. Max Jordan

*Director of Religious Broadcasts, National Broadcasting Company*

TO GUGLIELMO MARCONI the Father of Radio, religion meant a great deal. It is well known —and Orrin E. Dunlap, Jr., has told us quite a bit about it in his Marconi biography, which remains the best and most complete ever written—that the Senator took a strong personal interest in the affairs of his church. He was as deeply religious a man as other great scientists, such as Pasteur, Volta, Ampére, and Galvani. As a matter of fact, it was due to his initiative that the Vatican built its own radio station under Marconi's personal supervision.

It is not generally known, however, that it was while visiting the celebrated sanctuary of Oropa, not far from Milan, in 1894, that the great inventor had the first intuition of the possibility of communicating between distant points without means of conducting wires.

Marconi was then just 20 years old and had been engaged in physical experiments under the guidance of Professor Vincenzo La Rosa of Biella, near Oropa. One late afternoon, while walking through the fields around the sanctuary, he suddenly felt that he was the man destined to discover the means of transmitting messages through space. He said nothing about it at the moment, but in the evening, in walking from the sanctuary towards the city, he said to a friend who was with him, the poet Giuseppe de Abate:

"Up there when I was at the Chapel del Paradiso, a sudden wonderful idea struck me while I looked across the distant plain. You will see what I mean later on."

Now, at the Porta Regia of the sanctuary, a tablet has been inaugurated bearing this inscription:

> "From the cloisters of the mountain of Oropa, Guglielmo Marconi drew the inspiration of his great discovery—May wireless telegraphy under the auspices of Mary pacify men in Christ."

Today, we know that Marconi's discovery has indeed greatly contributed toward a better understanding and good will among men. The history of the "Pulpit of the Air" has not yet been written, but when it is it will add a striking chapter to the story of all religion.

### *Instrument of Religion*

Since its foundation, NBC has been guided by a simple policy in matters of religion. Realizing that the sale of time for religious programs might result in according a disproportionate representation to those individuals or groups who happened to command the largest purse, the company has never "commercialized" religion. Also, being aware of the fact that no broadcaster can attempt to serve individually all of the many religious groups, or wisely single out by its own choice any individuals to represent the various faiths, NBC has always depended upon responsible organizations representing the three dominant religious groups in America, namely the Protestant, the Catholic and the Jewish, to suggest speakers and prepare programs. And finally, the company has striven to build its religious programs so that they would interpret religion at its highest, avoiding controversy and conveying the message of faith to all the listeners in such elevating terms that all would realize their responsibility to the organized church and to society.

Adhering to these principles, NBC has been able to contribute its share toward making religion an ever-growing force in American life. The experience in all these years has proved that radio is one of the most highly effective instruments of religious teaching. Millions of people listen every Sunday, and in addition there are countless successful weekday programs based on religious gatherings, festivals and music. The result of all these endeavors was well summed up some time ago by Dr. Harry Emerson Fosdick when he said that radio has furnished religion an opportunity such as has never existed before.

That these religious broadcasts presented by NBC in cooperation with the nation's outstanding Protestant, Catholic and Jewish organizations leave lasting impressions among listeners of all faiths is shown by the many letters received. They testify that the audience is drawing spiritual inspiration and confidence from the sermons and prayers as well as the church music offered on the air, and gaining strength from these programs to meet the heavy sacrifices of a war against the forces of oppression and intolerance.

Outstanding among the regular religious programs broadcast by NBC are *The Catholic Hour*, produced in cooperation with the Na-

tional Council of Catholic Men: *The National Radio Pulpit*, with Dr. Ralph W. Sockman, pastor of Christ Church in New York as officiating clergyman, presented in cooperation with the Federal Council of the Churches of Christ in America, and *Religion in the News* by Dr. Walter W. Van Kirk, Secretary of the Federal Council's Department of International Justice and Good Will. During the Summer season, this latter program is replaced by the popular series *The Art of Living*, with Dr. Norman Vincent Peale as the speaker. Likewise, Dr. Frederick K. Stamm conducts a special summer series entitled *Highlights of the Bible* under the auspices of the National Radio Pulpit.

NBC's all-faith Sunday hymn feature, *We Believe*, is dedicated to all listeners who, now more than ever, whatever their creed, turn to God in these times of trial and tribulation. This program, which is broadcast Sundays at 1:30 p.m. EWT, is truly a contribution to the spiritual morale of the American people. In designing the series, NBC consulted religious leaders of all faiths, including the Federal Council of the Churches of Christ in America, the National Council of Catholic Men, the United Jewish Laymen's Committee and the Synagogue Council of America.

The listeners response to *We Believe* has been most enthusiastic. Letters have come from all parts of the country expressing warm appreciation and telling of the spiritual benefits drawn from this program.

The oldest radio pulpit of all times is the aforementioned *National Radio Pulpit*, which is heard every Sunday at 10:00 a.m. EWT. On May 23, 1943, it will observe its twentieth anniversary on the air. The *National Radio Pulpit* began with the late Dr. S. Parkes Cadman, celebrated Brooklyn pastor, over station WEAF and when the network of the National Broadcasting Company was formed, WEAF was the key station for the production of this program. During its entire history, the *National Radio Pulpit* has had the unanimous backing and cooperation of city, county and state councils of the churches in the United States and the major denominations of the Protestant faith through the Federal Council of Churches of Christ in America. The *National Radio Pulpit* has always upheld tolerance in the many Sundays it has been on the air, in the interest of the entire nation.

A short time ago the *National Radio Pulpit* inaugurated a policy of urging its listeners to attend their respective churches. An agreement was reached with the Federal Council of Churches whereby the program on Sunday mornings would be introduced with appropriate chimes followed by a brief announcement calling upon its listeners to go to church.




DR. WALTER W. VAN KIRK CONDUCTS THE PROGRAM "RELIGION IN THE NEWS" ON THE NBC NETWORK EVERY SATURDAY.

When the late Dr. Cadman appeared on the *National Radio Pulpit* he declared that he was speaking "in the common interest for the people of every race and creed from the forests of Maine to the orange groves of California, and from the reaches of the Northwest Territory to the Everglades." Records show that the people of this land welcomed the program and to this day make it their business to listen in every Sunday. To the shut-ins and the sick it has been a special comfort. During 1942, a total of 384,000 copies of radio sermons was distributed in response to audience-mail requests received by the Federal Council, these coming from forty-eight States, Canada, England, Australia, South Africa, India, the Canal Zone and various Latin American countries. In the same year, the Federal Council's Department of National Religious Radio received an average of 7,392 letters weekly.

Equally popular is *The Catholic Hour*, which went on the air for the first time on March 2, 1930, and is heard every Sunday at 6:00 p.m., EWT. Starting with a hookup of twenty-two stations, the program is now heard over stations situated in

THE PAULIST CHORISTERS ARE FEATURED DURING "THE CATHOLIC HOUR" BROADCASTS BY THE NATIONAL BROADCASTING COMPANY ON SUNDAYS.



forty States, the District of Columbia and Hawaii, including one short wave station broadcasting to the entire world. These outlets vary in number from seventy-seven to 107 and are all affiliated with the National Broadcasting Company. The National Council of Catholic Men, under whose guidance the series is presented, arranges the schedule of speakers and music, and handles the tremendous volume of audience mail—about 16,000 letters a month, averaged throughout the year.

When the late Cardinal Hayes appeared on the inaugural program of *The Catholic Hour* he said: "The purpose of the National Catholic Hour is not to triumph or to boast; not to attack or to blame; but to serve. . . . With good will, with kindness and with Christ-like sympathy for all, this work is inaugurated . . . this work of dedication voices, therefore, the hope that this Hour may serve to make known, to explain with the charity of Christ, our faith, which we love even as we love Christ Himself . . ."

Subjects discussed on *The Catholic Hour* are usually doctrinal, moral, or historical and the priest-speakers are chosen from many sections of the United States. The music is provided by the Paulist Choir in New York. The current speaker is the Rt. Rev. Monsignor Fulton J. Sheen who has won for himself a unique place in religious radio. During his last three series alone, this speaker received 642,227 pieces of audience mail.

NBC's interest in the activities of the Jewish religion has been no less active. Having been instrumental in the establishment of the weekly series of the *Message of Israel*, which is now carried by the Blue Network, at that time a part of NBC, the Company is not only devoting a good deal of time to traditional Hebrew chant in its weekly *We Believe* program, but also is trying to "cover" all the major events in the life of the Hebrew congregations of America such as Rosh Hashonah, Yom Kippur and Shabuoth. A special broadcast was recently devoted to the *United Jewish Appeal* for Refugees, Overseas Needs and Palestine, and again this year a Passover program is scheduled under the auspices of the Synagogue Council of America, which last year sponsored the *Festival of Freedom* program with Rabbi Israel Goldstein, Judge Irvin Lehman and Sam Jaffee, noted star of stage and screen, as the speakers.

### *"Radio" In Talmud*

All these broadcasts devoted to the Jewish faith are indeed memorable events when we remember Rabbi David de Sola Pool's statement that some 1500 years ago it was written into the Talmud that the sound of "radio" goes from one end of the earth to the other. The word radio stood for the spirit of rainfall, and yet the meaning of this writer in the dim past has assumed a truly modern significance now that wireless waves constantly span the globe.

Various programs are also planned by NBC from time to time in cooperation with the National Conference of Christians and Jews. This year, NBC carried a program in connection with Religious Book Week sponsored by the National Conference. Dr. Henry Noble MacCracken, President of Vassar College, Mrs. Roger W. Straus and Francis J. Sheed talked about present-day Protestant, Jewish and Catholic literature.

However, NBC has not confined itself merely to a national task in promoting audience interest in religious topics. The company has also been a real pioneer in world-wide religious broadcasting. The Christmas Day broadcast from the Roman Catacombs of St. Domitilla in 1937 is a case in point.

To those who were present in the chamber fifty feet beneath the soil of the Eternal City, this broadcast remains an unforgettable experience. The soft glow of flickering candles revealed a scene of classical splendor. Austere Roman pillars supporting the vaulted roof, ancient inscriptions in Latin and Greek carved on the walls and floor, symbolic religious emblems traced upon the marble slabs of the altar and on the primitive oil-lamps, stone coffins richly adorned with sculptured biblical figures — indeed it was an inspiring setting for a Christmas broadcast, fittingly carrying the listeners back to an age which, like our own, had its freedom of worship challenged by brutal tyrants.

Quite different in character though hardly less interesting was NBC's broadcast of the Oberammergau Passion Play. It was not the easiest thing in the world to secure permission for this exploit. The whole world sends pilgrims once in ten years to this charming Bavarian mountain village, whose folk think of their Passion Play as an act of religious veneration. Would not the radio introduce a hostile new note? Fortunately everything could be arranged, and one bright day a great radio motor-van, carrying all the necessary equipment, arrived in Oberammergau. There was no end of excitement. The village children were bursting with curiosity, suppressed and otherwise, and even their elders watched developments with an eagle eye. Broadcasting time finally came and the program which encompassed the basic scenes of the Play from the stage itself was a complete success.

Possibly a third program may be adduced to demonstrate the wealth of material that has been offered. Remembering that the whole world loves *Silent Night, Holy Night*, NBC thought of bringing this beautiful folk song by air straight from its Austrian birthplace. Accordingly, we investigated Hallein, a sleepy little town not far from




DR. RALPH W. SOCKMAN OCCUPIES THE "NATIONAL RADIO PULPIT," BROADCAST ON SUNDAYS BY NBC.

Salzburg which is proud of the fact that Franz Gruber, the village school teacher, composed the melody for his little church choir some hundred years ago. The roofs were covered with deep white snow, and wreaths of chimney smoke fluttered up towards the winter stars. If ever Santa Claus should have felt at home anywhere, it was in Hallein on that Christmas morning. The grandson of Franz Gruber sang the strains of *Stille Nacht* in the original version to the accompaniment of his ancestor's own guitar, which incidentally had also been used for the original performance, as the church organ happened to be out of order that night; and afterwards the village children took up the melody with real enthusiasm. Then, to make this a memorable Yuletide program, we sent the radio man round the world to bring the same tune from Buenos Aires, Hawaii and New York, showing what different interpretations it had been subjected to at all four corners of the earth. Finally we concluded at Salzburg, where the Cathedral mixed choir took up the entrancing theme with a majestic accompaniment from the great organ.

Many other instances could be referred to in order to show that radio has really opened up new vistas full of inspiration in the religious field. NBC's, for instance, was the "scoop" in 1933 when we made the bells of the Church of the Holy Nativity in Bethlehem ring around the globe on Christmas Eve. To NBC was likewise due the initiative in happier pre-war days for relaying to American listeners the great choirs of the synagogues of Amsterdam and Warsaw. Even more memorable, perhaps, was the broadcast from the Jewish Cemetery and the Ghetto in Prague, spots now defiled which enshrine amidst a great modern city unforgettable mementos of the Hebraic past in which tragedy and glory are so frequently blended.

That in brief is the story of religion in radio as far as NBC can tell it. I wish I could refer at this point to all that has been done by leaders in the field of religious radio abroad, particularly by the British and the Canadian Broadcasting Corporations, and by the many fellow broadcasters in this country whose contributions could hardly be enumerated within the compass of a brief article. Perhaps my readers will not take it amiss, however, if I add a word about some problems which arise in religious broadcasting.

Every deep faith has a certain "exclusiveness"—that is, a body of convictions and dogmas which sets it off from other faiths. Sometimes the cleavage is sharp and deep. Yet, there are also beliefs shared in common, or attitudes characteristic of every believer. Naturally, radio must seek to find these last. It cannot debate about religious matters, or bring antagonisms to the fore. To do so would mean getting entangled in a conflict which could not possibly be mitigated on the air.

### *Appeal Is Universal*

Yet it is often felt that this restriction to a few "ethical" themes and to the exercise of the irenic spirit weakens the expression of religious conviction. Does not radio tend to make all faiths "look the same?" I do not believe this is necessarily true. After all, the church does not live by broadcasting alone. It has the whole of the rest of life inside which to deepen its conception of the human and the Divine. Radio is just one of its opportunities—not by any means its only opportunity. Surely it can be utilized to bring home to all men, regardless of differences in belief, those things that make the whole world kin.

When we remember that Americans listen to the radio many hours a day, while the average person spends not more than one hour per week attending church, we may well appreciate the immense amount of good that can be accomplished by radio in the field of religion. These are times of stress when we need more than ever the strength and comfort which only a true faith in God can give. On the airlanes of this country the gospel of Light and Charity and the message of Tolerance and Brotherhood among men is being broadcast to the millions without any shackles being imposed by self-appointed arbitrary rulers. It is the tradition of freedom which helps our people to reap such benefits from a medium which originally was conceived as merely technical in its scope. Today we know that Marconi's inspiration was of deep significance. With a large part of the world covered by darkness, physical as well as spiritual, radio has become the chief instrumentality in upholding that most fundamental of all human freedoms—the freedom of worship.

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DR. MAX JORDAN (RIGHT) AT THE MICROPHONE COVERING FOR NBC'S AMERICAN LISTENERS THE VATICAN CITY CONCLAVE WHEN PIUS XII WAS ELECTED IN 1938.






FROM SUCH OPERATING STATIONS AS THESE IN R. C. A. COMMUNICATIONS, INC.'S, NEW YORK HEADQUARTERS, THIS COUNTRY IS IN INSTANTANEOUS RADIOTELEGRAPHIC COMMUNICATION WITH ALL PARTS OF THE WORLD.

# Communications Secrecy

## DIFFICULTY ENEMY WOULD HAVE IN DUPLICATING OUR EQUIPMENT AND FOLLOWING SIGNALS GIVES RADIOTELEGRAPHY RELATIVE SECURITY



By Ray Hutchens

*R.C.A. Communications, Inc.*

*(Editor's Note: "How long, because of unreasonable trust in cable secrecy, must we continue to play into the hands of the Axis?" asks Editor Ray Hutchens of R. C. A. Communications, Inc.'s magazine 'Relay.' Throwing new light on an old argument, Editor Hutchens contributes the following interesting discussion of the relative secrecy of cablegrams and radiograms.")*

THE following excerpt, from the Chief Signal Officer's report to the Secretary of War after the first World War, is taken from the November 16, 1920 issue of *Telegraph & Telephone Age*, journal of the American communications industry. It explodes the false "inherent-secrecy-of-submarine-cable" theory:

"Up to the time of making this study it had been generally assumed that it would be impracticable to tap an ocean cable without producing an electrical disturbance at the ends which would undoubtedly result in discovery.

"After a careful inquiry into the matter, Colonel Carty [the late Colonel John J. Carty, former vice president of the AT&T] reached the conclusion that it might be possible to tap successfully, and without discovery, an ocean cable, by employing some recent electrical discoveries. He devised a tentative scheme which was submitted to the engineers of the American Telegraph and Telephone Company, who reported that the scheme was probably workable. Accordingly, experts of that Company and the Western Electric Company undertook the development of the necessary apparatus. Radical improvements were made by them upon the first suggested idea; special apparatus was constructed; a ship was equipped and put to sea; connection was made with an Atlantic cable and *messages were intercepted, and a clear, legible record of them was obtained.* All of this was accomplished *without producing any disturbance whatever in the working of the cable.* It was clearly demonstrated that cable tapping could be accomplished in this manner, and that cable tapping so accomplished could not be detected by any possible means at the shore ends of the cable."

Exit "cable secrecy!" It was simple then, and it would be even simpler today, for the electronic art has advanced tremendously in twenty-four years. We would be unimaginative indeed if we believed that Germany, thorough in all other phases of espionage, would neglect so simple, so important, so inviting a task as cable-tapping.

### *Cables Cut in 1918*

During the last war, Germany had no trouble in locating and cutting cables connecting the United States with Europe and South America. The account given below is from the log of a German submarine officer whose ship, the *U-151*, was assigned to the task of cable-cutting as an incidental task during a program of mine-laying and torpedoing:

"Our next assignment was to cut the cables off New York harbor. We cruised leisurely up the coast, arriving off Fire Island just after sundown. The morning of May 28, 1918 was fair, with a gentle west wind and calm sea. . . . We could

see the beach, and the houses. . . . We dropped our cable-cutting shears attached to a grapnel overboard, attached to a long wire rope. Back and forth we cruised, trolling not for fish, but for any of the cables we might run across. The thrill was almost as great as fishing for bluefish." (From pp. 32-3, *German Subs in Yankee Waters*, by Henry J. James, Gotham House, 1940.)

The actual damage to the cables cut by the *U-151*, the author of the book says, was "relatively negligible" because *only two* were cut: the Commercial Cable Company's #4 Canso cable—Nova Scotia to New York—and another, owned by the All-America Cable Company, running from New York to Colon!

A cable can be cut, and its repair is difficult. A radiotelegraph circuit may be "jammed," but it cannot be put out of commission permanently. Jamming could bring reprisals to affect enemy circuits, and this is one reason why radiotelegraph facilities are comparatively secure.

A cable is not safe merely because it lies on the bed of an ocean. Proof is given in the Chief Signal Officer's report referred to above:

### *Urges Radiotelegraphy*

"It was concluded that complete severance of cable communication by the enemy was not impossible."

In the same report Colonel Edgar Russell, who later was to become Brigadier General and Chief Signal Officer, is quoted from a memorandum dated August 15, 1917:

"'From my own experience in cable engineering I am satisfied that it would be entirely practicable for the enemy to cut some or all of the cables whenever he considers it important enough to do so.'"

Five days later he wrote to the Commander-in-Chief of the American Expeditionary Forces:

"'There is no question of the grave situation in which we may find ourselves as a result of extensive cable cutting which, in the belief of all the cable authorities we have consulted, may be easily effected by the enemy. The enormous importance of immediate provision of reliable and extensive trans-Atlantic radiotelegraph service is therefore evident.'"

Thank Heaven that RCA heeded this warning, and provided emergency radio telegraph capacity which stands ready for use at any time!

Confirmation of the work of the *U-151* is also found in the report of the Chief Signal Officer:

"Information furnished by the Navy concerning the enemy's intentions seemed to be well founded, for while the German submarines were operating on the Atlantic coast of the United States, two submarine cables were cut about 100 miles from New York, one a cable from New York to Canso, Nova Scotia, which stopped working at 12:35 p. m. on May 28, the other a cable from New York to Colon which began to fail at 3:30 p.m. on May 28th and went out of commission entirely at 9:30 p.m."

If an enemy interceptor is ordered to copy radiotelegraph signals between two Allied points, he soon learns he cannot do it with portable equipment. When he attempts to follow the daily shifts of a single circuit, he must obtain complete tuning equipment for as many wavelengths as the total in use at both ends; he must, since he cannot personally operate on several wavelengths, monitor and record all stations continuously. He must also be near supplies and maintenance materials—which means he is in a disadvantageous location, for Allied antennas are aimed at each other, not at him.

From his records, he must duplicate whatever printer, multiplex, or coding devices are in use, and learn to distinguish between one type of signal—or combination of signals—and all the rest, and he also must follow the changes in them quickly. This work, even with receivers of the highest order, must necessarily be done with an inferior signal.

Radiotelegraph circuits are engineered over their ether routes as well as in the terminal offices. Everything in a modern radiotelegraph company, after years of practical operation with all types of equipment, is there because it helps to maintain maximum efficiency in propagation between two desired points on the earth's surface. Every phase of operation—switching technique, signal transcription, clerical work, novel apparatus—is combined for the fastest, most accurate signal transmission over the desired path.

If, having better equipment—a premise conceded only for the sake of discussion—the enemy interceptor is able to receive, record, and translate all our transmissions, on all our circuits, in both directions, he still cannot duplicate one of the most important factors: the engineering and operating technique of a communications company which for more than two decades, has been schooling itself by accomplishment day and night, seven days a week.

Speed of communication is a military advantage. Enemy delay is also an important secrecy factor.

One message route from New York to Cairo, Egypt, is via cable to London. From London, it is retransmitted, by cable or radio, to its final destination.

### *Radio's Advantages*

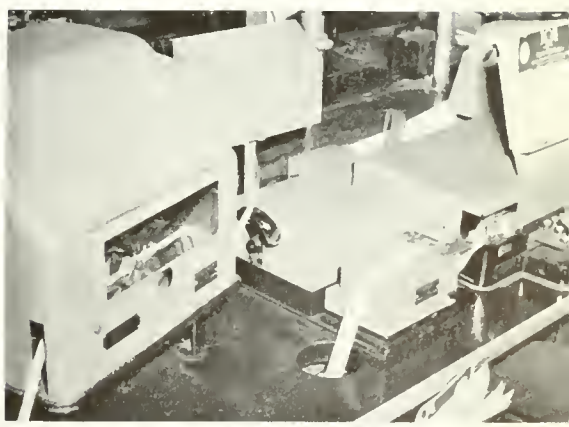
By radio, the message would go directly from New York to Cairo.

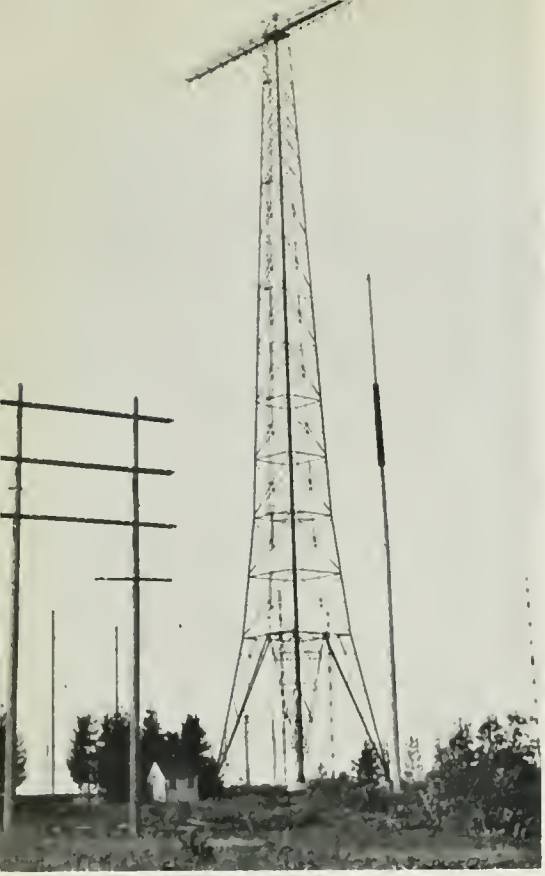
If the cable between New York and London were tapped, a cablegram from New York to Cairo *would be in enemy hands before the addressee received it!*

The wide frequency channels of radiotelegraphy allow the design engineer freedom in his choice of control equipment. Since some secrecy systems depend upon a sacrifice of frequency-band width, they

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THIS HIGH-SPEED RCAC PRINTER PREPARES MESSAGES FOR AUTOMATIC TRANSMISSION BY RADIOTELEGRAPHY ACROSS CONTINENTS AND SEAS.





DIRECTIONAL AND NON-DIRECTIONAL ANTENNA ARRANGEMENTS COVER THE LANDSCAPE AT RCAC'S LONG ISLAND, NEW YORK, RADIO TERMINALS.

operate better, and faster, in a wide radio channel.

Because of the physical and electrical characteristics of a long, insulated conductor, the frequency band of a cable is necessarily narrow, and the equipment which is attached to its ends must be designed primarily to favor this weakness.

The impenetrability of any coded message may be increased by novel control equipment while it is in transit.

Radio, however, offers opportunities for additional secrecy which the cables cannot: wavelengths may be changed, and there is usually a choice of transmitter locations by those in charge of the operating offices. Prearranged schedules to change these facilities can be used to complicate, frustrate, or delay intereception.

Only radiotelegraphy has these advantages. A cable station is fixed at the ends of a cable, and submarine-cable paths are charted and well-known.

The feeling still persists in some quarters that cable transmissions are secret. Despite the fact that the findings of the last war proved the only thing secret about cablegrams is their interception, conservative diplomats order that their confidential messages be sent by cable.

Our enemies (who, incidentally, send all *their* confidential messages between Rome, Berlin, and Tokio by radio!), knowing of this reliance, have good reason not to disturb the many vulnerable points of the Allied cable system. Why should they, for the sake of a partial and temporary disruption of our communications, give up their opportunity for interception of the most important messages the world has ever known?

### *Could Carry Full Load*

In the opinion of many communications men, the cables remain intact simply because our enemies do not choose to cut them. They know that modern radiotelegraph equipment could carry the full load of traffic between England and America, and that it could then be handled with greater speed and with a more complex mechanical encipherment.

It is interesting to note, that Japanese submarines, although they infest the Pacific, have not cut the cable between San Francisco and Honolulu. In the Pacific, as in the Atlantic, our present paralleling radiotelegraph facilities probably help to protect the cables. We may never learn what information we are losing through them, but, after the war, how bitter it will be if we find we would have been better off if we had *cut our own submarine cables!*

Today, after many pioneering struggles, America leads the world in aviation and radio. These two new sciences, more than any others, shall shorten and win the war. Let us give our best to speed the day.

Meanwhile, why cannot our radiotelegraph facilities be used to their greatest advantage in the interest of the United Nations? How long, because of unreasonable trust in cable secrecy, must we continue to play into the hands of the Axis?

## Tribute to Soldiers

TO THE EMPLOYEES OF THE RADIO CORPORATION OF AMERICA

NEW YORK NY—

APRIL 4 AM 10:12

ARMY DAY WILL NOT BE CELEBRATED THIS YEAR WITH THE USUAL MILITARY CEREMONIES AND PARADES. AMERICANS EVERYWHERE ARE TOO BUSY FIGHTING AND WORKING TO PAUSE, EVEN FOR A FEW MOMENTS. BUT THE OCCASION REMAINS A TRIBUTE TO THE SOLDIERS OF AMERICA. ON THIS ARMY DAY YOU WHO HAVE DONE YOUR FULL DUTY ON THE PRODUCTION LINE SHARE THAT TRIBUTE WITH AMERICAN FIGHTING MEN. OUR SOLDIERS ARE ON THE OFFENSIVE OVER EUROPE, IN NORTH AFRICA AND IN THE PACIFIC. WITH YOUR CONTINUED SUPPORT THE ARMY WILL KEEP THAT OFFENSIVE ROLLING UNTIL VICTORY REWARDS OUR EFFORTS—

PATTERSON
UNDER SECRETARY
OF WAR.

## Educators Praise Radio

The old copybooks are gone and the radio receiver is now a standard piece of classroom equipment, according to Dr. Belmont Farley, co-ordinator of radio activities for the National Education Association. Dr. Farley was addressing 400 teachers and students gathered Sunday, February 28, in NBC's Radio City Studios at dedicatory ceremonies for the first courses based on radio programs to be accepted by New York City's Board of Superintendents for teacher in-service training.



PAUL WHITEMAN SIGNS BLUE NETWORK CONTRACT. WITH HIM ARE PHILLIPS CARLIN, VICE PRESIDENT, (CENTER) AND MARK WOODS, PRESIDENT OF THE BLUE.

# PAUL WHITEMAN JOINS BLUE

*Dean of Modern American Music, Named Music Director of Network, to Supervise Planning of Programs, Discover and Develop New Talent*

IT IS hard to believe that in the space of a swift quarter-century, the history of music could be re-written, and a new era, an era symbolic of all that young America stands for, would be enscribed on the blackboard of time by one man above all others.

Today, standing at the threshhold of a new career which will offer him even greater fields than he and his fellow trail-blazers ever hoped to explore, is Paul Whiteman, dean of modern American music, who recently was named music director of the coast-to-coast BLUE Network.

In taking on his new role as a BLUE radio executive, Whiteman will keep his weather eye peeled for new talent, and once discovered, it will be developed as were the others. He will act in a supervisory capacity for the planning of musical programs, and cooperate in the production of new programs for potential commercial sponsors.

"Pops," as he is known affectionately to all in the music world, would be the last to agree that the part he played in the renaissance of American music was a major one.

He will offer you such names as Bix Beiderbecke, Gene Goldkette, Louis Armstrong, King Oliver, Jellyroll Morton, Johnny Dodds, Joe Venuit and the original Dixieland Band, and all the other immortal stylists, as the men who dreamed jazz into existence.

He will insist that theirs was the greatest contributions to the swing-over from the accepted, stilted one-two-three step style, so deeply ingrained in American music to the high, wide and handsome forerunner of the boogie-woogie beat.

Which is true, to a certain extent. But it took one man—Paul Whiteman—to corral the unruly notes, to curb the irresponsible Dixielanders and to correlate all their native ingenuity into an understandable form which was to become a definite and dignified pattern in the over-all musical picture.

Whiteman, unlike other dreamers of the early days when growing pains were beginning to presage the coming revolution, kept his head, and tightened a strong noose around the unruliness, which was breaking out like a plague of musical measles.

By every force of circumstances and heredity, Whiteman was destined to be the man for the job, since he was armed with a thorough musical background. For one thing, his father, Wilberforce James Whiteman, had been supervisor of music for the Denver, Colo., public school system for fifty years. Whiteman pere was the organizer of school orchestras. Mrs. Whiteman had been a fine coloratura, who frequently made appearances with a singing group.

It was natural, then, that out of this old-line musical menage should come the new leadership, and the future King of Jazz. Not that young Paul hadn't had his share of the long-haired schooling. He had, but it breezed over his sturdy frame, leaving only enough of its influence to form the framework of a style which, in due time, was to become the basis of the original Whiteman rhythmic metre.

In whipping his first band into shape to open at the Alexandria Hotel in Los Angeles, Whiteman had more to do than just to wield a baton. He had to convince his boys that there must be a ceiling for the hitherto untrammeled high notes—letting them shoot off into the air and fall where they may in the accepted jazz tradition was not the thing to do any more.

Jazz, as it was being accepted in those days, was going to take off its rompers and put on long pants, not to mention a top hat and silk tails, protests to the contrary, if Whiteman had anything to say about it.

With his debut on the Coast, he found all his pleas and plaints for a chance to prove his point fully justified, for the clients called loud and clear for "that sensational new Whiteman band." Thus was launched the new era of American music. Through Whiteman, it acquired a symphonic dressing which was to assure him, and all who were to follow in his footsteps, a fair share of immortality.

As Whiteman kept pacing the new trend in music, quietly installing subtle melodic changes as the need for them arose, there came upon the scene another trail-blazer in whom Paul found a sincere kin-

ship. He was George Gershwin.

Gershwin, too, was charged with a dream—to carve into concrete realization a new expression of the American way of life. As this great new work was being moulded and re-moulded by Gershwin, Whiteman stood by and encouraged the young composer.

When "Rhapsody In Blue" was introduced by Whiteman before a distinguished and highly critical audience in Carnegie Hall, it won for Gershwin lasting fame, and for Whiteman, a new crown: that of "Dean of Modern American Music." Since then, "Rhapsody In Blue" has been identified as Whiteman's musical signature.

There were others for whom Whiteman envisaged great things —Bing Crosby, Morton Downey, Ferde Grofe, Helen Jepson, Mildred Bailey, Jane Froman, Ramona, the Dorseys, and a host of others now in the spotlight of fame. All served their apprenticeship with Whiteman.

Whiteman's talents run to other fields as well as music. He owns and manages a 700-acre farm in Rosemont, N. J., with 350 acres for cultivating barley, wheat, corn and alfalfa. He also has large herds of Aberdeen Angus cattle, Hampshire hogs and walking horses. Incidentally, that's the name of his farm —"Walking Horse."

Paul certainly has no objection to being called a gentleman, but never a gentleman farmer, for he has made a business of farming for the past five years, and a profitable business it has turned out to be. In his own little community, Farmer Whiteman bears quite a reputation, and he takes just as much pride in it as he does in his $5,000,000 musical library with its thousands of special Whiteman arrangements.

Sincerity in every endeavor has been a Whiteman trademark through the years. As musical director of the BLUE, he hopes to make that same trademark a national one, wherever music can be heard and appreciated.

# SIGN TOSCANINI, STOKOWSKI

ARTURO TOSCANINI and Leopold Stokowski will again conduct the NBC Symphony Orchestra during the 1943-44 season, according to an announcement March 23 by Niles Trammell, president of the National Broadcasting Company, who disclosed that the 24-week Winter series will be equally divided by the two world-renowned symphony directors.

The new season, starting October 31, will mark the seventh year of the NBC Symphony and will represent Maestro Toscanini's sixth full season with the orchestra that was organized for his return from semi-retirement in 1937. For Stokowski, it will be the third consecutive season on the NBC podium.

"Music is a major heading in the public service broadcasting performances today," said Mr. Trammell. "In wartime, it is more important than ever, playing a vital part in the nation's morale, in addition to filling its customary cultural and entertainment roles.

"Continuing under the inspiring leadership of Toscanini and Stokowski, the NBC Symphony is assured of maintaining the high standards to which listeners have become accustomed through six years of broadcasting, concert and recording achievement."

The 1943-44 season will continue to utilize the established Sunday afternoon hour, 5:00 to 6:00 p.m., EWT, which, on the basis of listener response this reason, has proved to be the most popular listening time in the orchestra's six years of existence.

Toscanini will conduct the first six concerts, October 31 through December 5; Stokowski will direct 12 consecutive programs, December 12 through February 27, and Toscanini will return for his additional six broadcasts on March 5, concluding the season April 9.

# RCA PRODUCTION FEAT

*54 Ships Sail on Time as Result of Workers' Efforts at Camden*

A PRODUCTION feat which made it possible for fifty-four ships to sail on time from seventeen different American ports came to light when naval officials recently authorized the RCA Victor Division of the Radio Corporation of America to make public certain facts relating to a rush order for vital radio equipment.

Where the ships were going, what they carried and whether they were warships or merchantmen are military secrets. All that may be said is that they were awaiting radio equipment not to be described until they have helped win the war, and that they were scheduled to leave around the first of the year. To make that possible a new record in high speed production was established at RCA Victor's Camden, N. J., plant.

This became necessary because shortages of essential materials developed after the initial order had been placed. Suppliers of parts made from these materials delivered some of the units. Then the materials bottleneck cropped up, and precious time flew by while Government officials and company executives sought to crack it.

Unexpectedly the break came on December 29. On that date, RCA Victor was notified that a first shipment of the badly wanted parts would arrive sometime on the afternoon of the following day. The company was also asked to break all previous production time records in getting out the shipment.

As a consequence all was in readiness in the shops at two o'clock the next afternoon — December 30 — when the parts began to arrive. By three o'clock the job was rolling. The equipment was highly complicated, requiring skillful and delicate handling. Deliveries—for the ships—began on December 31. The final units to complete the order left the plant on January 4. A lot of tired workers went home to sleep, happy in the knowledge that the ships of America's life line to its fighting fronts were sailing — on time.



RADIOMARINE RECEIVES "M" PENNANT. LEFT TO RIGHT HUGH A. SAUL, I. F. BYRNES, CHARLES J. PANNILL, AND REAR ADMIRAL H. L. VICKERY.

# RADIOMARINE AWARDED "M"

*U. S. Maritime Commission's Pennant, Victory Fleet Flag, and Merit Badges for Employees Won for War Production Record*

AWARDING the U. S. Maritime Commission "M" pennant, Victory Fleet Flag and Maritime merit badges to employees of Radiomarine Corporation of America, Rear Admiral Howard L. Vickery, U.S.N., Vice Chairman of the U. S. Maritime Commission, on March 8 praised the workers for on-time delivery of vast amounts of radio equipment for the Merchant Marine despite innumerable difficulties in procurement of materials.

"You have been providing the merchant marine of your nation with eyes, ears, and a voice—three requisites to successful conduct of wartime operations for our merchant vessels," Admiral Vickery said. "Apparatus and equipment which have been designed and produced in your plant are making a substantial contribution toward a United Nations victory. Often you have been ahead of schedule. It never has been a case of too little and too late."

Arthur M. Tode, Honorary President of the Propeller Club of the United States, served as chairman of the presentation ceremonies. R. J. Baker, Secretary-Treasurer of the American Merchant Marine Institute, Inc., one of the honor guests, spoke briefly.

Acceptance of the "M" Pennant and the Victory Fleet Flag by Radiomarine was acknowledged by I. F. Byrnes, Chief Engineer, and Hugh A. Saul, Production Superintendent.

Following the raising of the pennant and the flag by the Color Guard of the Fort Hamilton Memorial Post, American Legion, Admiral Vickery presented the Maritime Merit Badges. They were accepted by a plant committee composed of Victoria Zimanski, representing the General Office; Gordon C. Hopkins, Engineering Department; W. H. Courtney, Maintenance, Repair and Inspection Department; Leon J. Bilyk, Shipping Department, and Ralph Angelillo, Shop.

A scroll, bearing the signatures of all Radiomarine employees to a pledge not to falter in their work until Victory is won, was presented to the Maritime Commission by Chester O. Harris, an employee.

Miss Dorothy Kirsten, soprano of opera and radio, sang "America" and "The Star Spangled Banner." The ceremonies were broadcast by WJZ, Key Station of the Blue Network.

# DAKAR CIRCUIT OPENS

*RCAC Extends Direct Radiotelegraph Service to West African Key Port*

EXTENDING direct radio communication service to another sector important in United Nations war strategy, a radiotelegraph circuit between New York and the West African key port of Dakar was opened March 10 by R.C.A. Communications, Inc.

Formerly, telegraphic messages between the United States and French West Africa were routed by way of London. With this direct radio circuit in operation, message traffic moves much faster and cheaper, since RCAC negotiated a 15 per cent reduction in the rate.

The new service is operated in cooperation with the Administration of Posts, Telegraph & Telephone of French West Africa. Other RCAC direct radiotelegraph circuits with African terminals link New York and Monrovia, Liberia; Leopoldville, Belgian Congo; Brazzaville, French Equatorial Africa, and Cairo, Egypt. A radiophoto circuit also operates between New York and Cairo.

A direct radiotelegraph circuit between New York and Quito, Ecuador, is being tested by RCAC preliminary to the start of regular commercial operations. Until now, Ecuador, where a complete cable monopoly has existed, has been the only South American country closed to radiotelegraphic communication.

The Government of Ecuador is cooperating with RCAC in setting up this new radio service. With the addition of Quito, sixteen Latin American nations will be linked with this country by RCAC direct radiotelegraph circuits.

The radio equipment for the Quito station was designed and built by the RCA Victor Division of Radio Corporation of America.



PILOT OFFICER GEORGE BEURLING, CANADA'S AIR ACE, PRESENTS MERIT PINS TO FORMER FELLOW WORKERS IN RCA PLANT AT MONTREAL.

# HERO LAUDS RCA WORKERS

*Pilot Officer Beurling, Former Employee in Montreal Plant, Returns as Canada's Ace Air Fighter, Presents Merit Pins to Production Winners*

MONTREAL, Canada.—It was a highly dramatic moment when the smiling young hero of Malta, limping slightly, but with a look of happy anticipation on his face climbed out of an Air Force car and came in the RCA Victor plant here recently to visit again with his former fellow workers. George Beurling, modest and unassuming, of the Fourth Floor Assembly, had returned, still modest, still unassuming . . . but now he was Pilot Officer Beurling, Distinguished Service Order, Distinguished Flying Cross, and Distinguished Flying Medal and Bar.

Addressing 115 topflight Production Boosters, after he had presented them with the first of the Merit Award Pins which their outstanding efforts had won them, P O Beurling said:

"Radio keeps us flying . . . it keeps flyers on their course, and takes them to the target . . . and it brings them back. It has been said that this is an all-out war . . . that means each individual, no matter what your war job, must give his best. You people in radio, knowing your importance, especially to flyers, sailors and soldiers, can be assured that we appreciate your contribution. You share equally in the victory which we SHALL win!"

At his own request, and despite his still healing wound which necessitated his return to the hospital, P O Beurling insisted upon being taken through the plant where he could say "Hello" personally to everyone. Guards chaired him through the whole factory.

At 21, P O Beurling is Canada's outstanding war ace. His total bag of enemy planes, up to the time he was sent home to recuperate, was 29. On one morning alone, while helping in the defense of Malta, island hot-spot of the Mediterranean, he brought down four German and Italian fighters and was given credit for one "probable" victory. He was in the air over Malta many times, before being shot down last October, when the odds against him were as much as twenty to one.

Beurling credits most of his success to his development of "deflection shooting," that is, firing at an enemy plane from an angle. This type of shooting takes into consideration not only the angles of both planes in a combat, but also their air speeds and the distance that separates them. He believes that if he had not developed it his air score would be 6 instead of 29. He is the author of a book on the subject, which the British Air Ministry has published for the use of Royal Air Force pilots.

## PURCHASE AGREEMENT

*RCA Victor Announces Plan for Post-war Delivery of Theater Equipment*

THE first plan within the industry designed to meet the post-war demand for theater and sound projection equipment has been announced by the Radio Corporation of America.

Known as the "Purchase Priority Plan," it offers to forward-looking exhibitors the opportunity to apply now for post-war deliveries of RCA sound and other theater equipment the manufacture of which has been halted by the war.

In brief, the plan provides, first, a preferred position for a theater owner on the "priority purchase" list; and second, a method of building up an interest-bearing cash reserve for the theater owner to apply against his post-war purchases.

Explaining the need for this plan, Homer B. Snook, manager of the Theater Equipment Division of RCA Victor said:

"When the war ends, hundreds—perhaps thousands—of theater exhibitors will need new equipment badly. Also, population shifts have caused demands for many new theaters — and therefore much new equipment. All this adds up to a big initial post-war demand, one which may exceed the supply for as long as two years. The RCA Purchase-Priority Plan enables a theater owner to earmark equipment for his post-war needs and at the same time build up an interest bearing reserve to help pay for it."

When the company is able to resume normal manufacture and deliveries, the theater operator can convert his "priority purchase agreement" into a standard form of order or contract at prices and at terms then in effect, and apply his advance deposit and interest as a down payment. The time allowed to negotiate such a conversion will be announced by RCA Victor and will be based largely upon its production outlook at the time.

# NAME LABORATORIES GROUPS

*Sarnoff Appoints Advisory and Planning Committees to Work With RCA Laboratories—Functions Are Outlined in General Order*

LOOKING toward the fullest coordination between research and operations and to the planning of future developments in radio-electronics, David Sarnoff, President, Radio Corporation of America, in a general order issued March 18 named two important committees—Advisory and Planning—for RCA Laboratories at Princeton, N. J.

Said Mr. Sarnoff:

"When the plans were announced for the erection of RCA Laboratories at Princeton it was stated that certain committees would be organized. Since the initial portions of the Princeton project are now substantially completed and in operation, the following committees are hereby appointed:

"ADVISORY COMMITTEE: David Sarnoff, Chairman; R. R. Beal, Gano Dunn, DeWitt Millhauser, C. J. Pannill, O. S. Schairer, Robert Shannon, G. K. Throckmorton, Niles Trammell, W. A. Winterbottom and Mark Woods.

"The purposes of this Committee are to give the management of RCA Laboratories the direction and advice of directors and executives of the other RCA divisions and Companies, and to provide a medium for informing such directors and executives of the products of the Laboratories to the end that prompt and advantageous public use may be made of them.

"This Committee will meet from time to time upon call of the Chairman in the Laboratories at Princeton.

"PLANNING COMMITTEE: O. S. Schairer, Chairman; Engineering—R. R. Beal, Group Chairman; H. H. Beverage, I. F. Byrnes, E. W. Engstrom, H. G. Grover, O. B. Hanson, C. B. Jolliffe, C. W. Latimer, A. F. Van Dyck; Commercial—E. C. Anderson, Group Chairman; H. C. Bonfig, F. R. Deakins, L. de Bottari, H. Heath, E. Kobak, F. E. Mullen, J. G. MacKenty.

"The functions of this Committee will be to consider, and to plan for, the future development of the radio, electronic and kindred arts and industries, and to provide a medium for coordinating the research, development, engineering and commercial planning of all branches of the RCA organization. It will deal with such subjects as television, frequency modulation, facsimile, extremely high frequencies, radio relays, and all other new systems, services and products.

"This Committee will meet in the Laboratories at Princeton on the first Tuesday of alternate months beginning Tuesday, April 6, 1943."

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## NEW RCA SUBSIDIARY

*Service Company Organized for More Efficient Handling of Installations*

A SEPARATE subsidiary, RCA Service Company, Inc., for the more efficient handling of the technical servicing and installation activities of the RCA Victor Division of the Radio Corporation of America, has been formed.

Edward C. Cahill, manager of RCA Victor's sound equipment activities, is president of the new company; he will also retain his other responsibilities with the RCA Victor Division. W. L. Jones, former manager of RCA Victor's Service and Installation Division, is vice president and general manager of the new company. There are no changes in either the managerial or technical staff of the RCA Victor service organization, which is now incorporated in its entirety within the new company.

RCA Service Company, Inc., will continue to devote a major part of its activities to the installation and servicing of vital radio and sound equipment for our armed forces wherever they may be, and in all parts of the world.

Twelve district service offices are maintained in Hollywood, San Francisco, Dallas, Kansas City, Atlanta, Pittsburgh, Cleveland, Chicago, New York, Boston, Philadelphia, and Scranton. From these offices a highly trained technical staff installs and services theater sound reproducing equipment, broadcast station equipment, and other RCA radio and sound equipment for industrial plants, schools, churches, hospitals, and the home.

The new Company will also continue to conduct its training school for technicians in Philadelphia for the U. S. Signal Corps.

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The BLUE Network devoted 122 hours and 59 minutes to the war effort in March, 1943. Of the total amount of time, 93 hours and 56 minutes was sustaining, contributed by the BLUE, and 28 hours and 53 minutes, commercial contributed by the BLUE's sponsors.


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MISS FLORENCE ROTHSCHILD, ONE OF THE NEW NAVY "WHIPS," INSPECTS RADIO EQUIPMENT IN THE RCA VICTOR DIVISION'S PLANT AT CAMDEN.

# NAVY "WHIPS" AT RCA VICTOR

*New Unit of Women Workers at Camden Plant Serves as Inspectors*
*50 Girls Release Like Number of Men for Other Essential Jobs*

ADD the "Whips" to the list of women's groups who are giving their best to the war effort—on the production line.

This new unit recently came to light at the RCA Victor Division plant of the Radio Corporation of America at Camden, N. J., where a force of about fifty girls and women are now performing production work for the Navy and thereby releasing a like number of men for other essential duty.

Official insignia of these girls is U.S.N.I.S. — United States Naval Inspection Service. But the girls have tagged themselves, and are being called by their co-workers, the Whips. They are authorized to wear a snappy light navy blue uniform that keeps them reminded of their big responsibility on the job. Their's is the job of inspecting all types of naval radio, sound and electronic equipment after it has passed through the hands of RCA's inspectors. They see their jobs as "whipping" out defects so that this equipment will give top performance in action.

The girls are the first graduates of a vocational training program in Philadelphia instituted by the Federal Government in cooperation with the State and city school systems to make womanpower available in war plants requiring technical skills.

"We made it clear to all the applicants at the outset," said Commander J. F. Bates, U. S. N., Chief Naval Inspector at RCA Victor, "that they were taking over work that had been done by male inspectors. We told them that though they were civilians hired for an eight-hour day they would be expected in emergency to live up to Navy traditions and get the work out.

"The fact that our force of women inspectors has been rapidly increased and is still being expanded is eloquent evidence that they have met and accepted these conditions. On occasion the girls have worked until late hours at night, and with unabated enthusiasm. At much of the tedious, painstaking inspection work they have proved more apt, and have learned more quickly, than men. We had seldom put a man on inspection alone in less than six months. Some of these trained and skillful women learn to do the work in two months."

Ages of the women naval inspectors at RCA Victor range from a couple of 17-year-olds to grandmothers of 50-plus. Typical are youthful Mrs. Ida Coppinger, tall, blonde and comely; Miss Florence Rothschild, a petite brunette; and red-headed Miss Mary Gilbert. Mrs. Coppinger was Secretary for the Boston Symphony Orchestra when her husband went into the Army. He was assigned to Camp Dix, so she came to Philadelphia to be near him and get into war work.

"I chose working for the Navy when I heard of this special course," said Mrs. Coppinger, who lives at 2221 Delancey Street, Philadelphia. "Besides, I always liked Navy blue. Also — as we say in the Navy — somebody has to taxi the Army across. I'm doing the best I can. Everytime I stamp the Navy anchor on a piece of radio equipment I kiss it goodbye and tell it to go do its work."

Mrs. Coppinger's father was an electrical contractor. As a child, she had some hard-boiled training digging around in old houses and helping him to sneak wires through conduits, but she knew nothing about radio until she took the special course.

Miss Rothschild didn't even know anything about electricity. She had never handled a tool in her life. Her former occupation was teaching in a private school in New York, and she spent her Summer months as Secretary of the Berkshire Music Festival. Her home now is at 5810 Whitby Avenue, Philadelphia.

Hair-do's and complexion creams, permanents and other mysteries of the beauty shop constituted the working background of Miss Gilbert, who lives at 144 Garvin Boulevard, Camden. She is tremendously interested in the work, but says the biggest thrill she gets out of her job is when naval officers spot the insignia on her overcoat and give her a courtesy salute.

"I've even been saluted by Commanders," laughs Miss Gilbert. "You'll never know what a thrill that is."

At their work the women use micrometers, calipers, scribers to test tightness of soldered connections, a dentist's mirror to get a look at vital points not visible from outside the apparatus, screw drivers and other tools. They must also handle blue prints, and most of them have taken special courses for this. Most of them also are studying now on their own time in one or more of the RCA Victor special classes.

An unexpected but warmly welcomed by-product of the introduction of women naval inspectresses in the shops has been the effect on the production line morale. According to Harry LeRoy, RCA Victor's Camden Works Manager, the enthusiasm of the girl inspectors is contagious. It has acted as a challenge to the craftsmanship of the male workers.

"Naval inspection of radio and electronic equipment," said Mr. LeRoy, "is always, necessarily, rigid. No one would say that the women inspectors are tougher than the men, but there is no denying that they have keen eyes and unlimited initiative, and they're plenty tough. No skilled workman taking pride in his craft likes to have rejects, but it irks him a lot more if his work is turned back by a woman.

"As a consequence, we've found a spirit of friendly competition developing in every shop in which the Navy has placed women inspectors. The fact that most of these women could earn more money in their former professions or careers is known to the workmen, though the women don't boast about it. They are making sincere, earnest and patriotic sacrifices to get the war over as soon as possible. This example cannot help but inspire the men to put the same spirit into their work."

All the women in the group were required to take tough civil service examinations. There was a rigid weeding out process, and only those with high ratings and unusual ability were accepted. Minimum educational requirement is a high school education, but most of the women are college graduates, and all of them are thoroughly imbued with the Navy spirit.

The course for Navy women inspectors runs 408 hours on a schedule of eight hours per day, six days per week, no holidays and plenty of homework.

The first fourteen graduates, trained specifically for inspection work at the RCA Victor plant, were sent over on an experimental basis by the U.S.N.I.S. The results were so highly regarded, both by Navy officials and RCA management, that succeeding graduates were immediately placed with the company.

With the training program a practical success, it is being extended to other war plants throughout the country making naval radio and electronic equipment, according to the office of the Inspector of Naval Material of the Fourth Naval District, Philadelphia.

## New Television Course

English-made films, explaining the mechanism of the enemy's newest explosive types of incendiary bombs and demonstrating effective means of extinguishing the lethal shells, are being used in NBC's revised Air Raid Warden's course, televised every Monday at 4:00 p.m., and again at 7:30 p.m., over Station WNBT.

Since February, 1942, when the first Air Warden lessons were televised, more than 250,000 wardens have attended the lectures through the medium of television sets installed in New York's eighty-two police precinct stations. Completion of the course is mandatory for warden-candidates.



FIRST RADIOPHOTO TRANSMISSION FROM STOCKHOLM WAS THIS PICTURE OF DIRECTOR GENERAL OF SWEDISH TELEGRAPHS H. STERKY.

## RADIOPHOTO SERVICE

*New Circuit Opened By RCAC Links Stockholm, Sweden, With N. Y. City*

ESTABLISHING radiophoto service between this country and a neutral European nation for the first time since the outbreak of war, a new circuit linking Stockholm, Sweden, and New York was opened February 22 by R.C.A. Communications, Inc.

Opening of the 3,976-mile New York - Stockholm circuit enables RCAC quickly to service photographs and other graphic material to and from all sides of the European war theater. With Stockholm in the North, other RCAC radiophoto circuits link the United States with London in the West, Moscow in the East, and Cairo in the South.

The Stockholm service, which was under test in cooperation with the Swedish Telegraph Administration for several months, brings to seven the number of radiophoto circuits operated by RCAC between the United States and various sections of the world. There is a New York-Buenos Aires service and, in addition, RCAC's San Francisco terminal receives radiophotos from Melbourne and Honolulu. Transmission of a picture over any of the circuits requires only six to ten minutes.




LIEUT. FOLLETT BRADLEY, NOW A MAJOR GENERAL, AND LIEUT. HENRY A. ARNOLD, NOW A FULL GENERAL, IN THE AIRPLANE FROM WHICH LIEUTENANT BRADLEY SENT THE ARMY'S FIRST MILITARY RADIO MESSAGE ON NOVEMBER 2, 1912, AT FORT RILEY, KANSAS. RIGHT—MAJ. GENERAL BRADLEY, AS HE APPEARS TODAY.

# RADIO WINS HIGH TRIBUTE

*Maj. Gen. Follett Bradley, Sender of First Military Radio Message from Plane in Flight, Hails Advances In Aviation Communication*

ONE of the greatest tributes ever paid to radio, particularly the part it is playing in today's global warfare, recently came from Maj. Gen. Follett Bradley, the man who sent the first military radio message from an airplane in flight.

Speaking during the February 7 world-wide broadcast of "The Army Hour" by the National Broadcasting Company, General Bradley, who is now Air Inspector of the U. S. Army Air Forces, said:

"A little more than thirty years ago—on the second of November, 1912, to be exact—I sent a radio message from an airplane. That was the first military radio message ever sent from an airplane in flight. I was a First Lieutenant then, and my pilot was another Lieutenant by the name of Henry H. Arnold—now Lieutenant General Henry H. Arnold (later named a full General), Commanding General of the Army Air Forces. And down on the ground at the receiving station was still another Lieutenant, Joe Mauborgne. Major General Mauborgne was retired a year and a half ago as Chief Signal Officer of the Army.

"We had arranged this test, the three of us, to demonstrate that artillery fire could be accurately controlled from an airplane in flight, and the test was eminently successful, although we had no way of receiving messages in the plane. We merely flew over the receiving station and they waved back at us to let us know they'd heard us. As I sat there, on practically nothing at all—the plane was an old Wright 'B' Pusher, and we sat out in the open air with two propellers buzzing at our necks, and we had no parachutes or safety belts, either—as I sat there, tapping a key strapped on my leg, I am sure that I had no inkling whatever of the tremendous gains that were to be made in the coming thirty years in aerial communications. Neither, I am sure had my companions.

"I have watched aerial communications grow up along with the other developments in aviation, and I think I can say truthfully that I have seen miracles come to pass. I went to Russia and certain other places last year. On that trip we had American radio operators aboard, we had Russians, and we had Chinese. And I discovered that the science of radio communications is indeed a universal language—a language that speaks to men of all races equally.

"Today's global warfare could not be carried on without the magic of communications—and the intensive operations of aerial warfare would amount to aimless guerilla fighting without our highly developed communications system.

"We are able to talk from continent to continent, we guide our fighters, our bombers, our transports over unchartered skies with an ease and skill that we who sent that first radio message from a plane would have gasped at that day thirty years ago.

"The men who operate our communications systems deserve all the credit that can be heaped upon them—they are the men who guide our planes out into unknown parts, and who send, receive and transcribe the messages that bring them safely back.

"I am a pilot myself, and I know a pilot's responsibilities and his job. I have sat beside navigators, bombardiers, engineers, in flight and marvelled at their skill. But each and every one of them knows that the magic hand that keeps them all flying—them and their plane—and that brings them home again, is the hand at the radio key.

"There have been mighty changes since that day, and it is a good and useful thing that the changes have come—for now we have not only the best fighting equipment in the world, but the best communications equipment and the best men to use it."



MRS. HELEN WORTH LOVE (LEFT), JAMES DAUGHERTY, AND MISS MARY H. DAVIS, WHO WON CERTIFICATES OF INDIVIDUAL PRODUCTION MERIT FROM THE WPB FOR THEIR OUTSTANDING SUGGESTIONS TO SPEED THE WAR EFFORT.

# WPB HONORS RCA WORKERS

*Nineteen Employees of RCA Victor Division Win Certificates and Letters of Honorable Mention for Individual War Production Merit*

FOR individual production merit in the war effort, nineteen employees of the RCA Victor Division were among the 157 workers in the nation to win War Production Board awards in March. The awards were made by the WPB through forty-four Labor-Management Committees in as many plants.

RCA Victor, for the second time since the WPB inaugurated its system of civilian awards last September, led all other companies in the total number of honors received. Of the nine women who shared in the list of awards, three are employed at RCA Victor's Harrison, N. J., plant. Moreover, two of these three women won Certificates of Individual Production Merit.

RCA Victor's winners of Certificates are:

Mrs. Helen Worth Love, Harrison plant, whose suggestion for rearranging a terminal board assembly on radio tubes will save 19,400 hours of labor.

Miss Mary H. Davis, Harrison plant, who made two suggestions on tube production which will save 2,050 hours of direct labor and $1,400 in materials.

James Dougherty, Jr., Camden plant, who designed a pair of pliers with a simple adjustable screw that solved a baffling problem of rejections in switch wafers.

Letters of Honorable Mention were received by the following RCA Victor employees:

M. D. and R. K. Harrison, special ratio board for testing transformers, RCA Victor Division, Radio Corporation of America, Camden, N. J.

R. D. Hughes and Charles Thiel, RCA, Camden (now at RCA Laboratories, Princeton, N. J.), suggested an improved feed through bushing in by-pass filter capacitors.

William Goble, RCA Victor Division, Radio Corporation of America, Harrison, N. J., two suggestions on radio tube operations.

Peter Janis, engineer, RCA, Harrison, redesigned a tube.

Harold Lipschultz and Fay Stareski, RCA, Harrison, changed the welding operation on a cathode.

Harris B. Kort, RCA, Harrison, devised an electrical method of forming tungsten filament leads for a specific type of power tube.

Daniel Battstone, RCA, Harrison, suggested elimination of unnecessary wing micas in certain magic eye receiving tubes.

George Van Wagoner, foreman, RCA, Harrison (two suggestions), adapted a single row fixture to a double row for spraying filaments, and designed a new multiple welder.

Thomas H. Briggs, chief engineer, RCA, Harrison, suggested change in the flashing operation on getters, which formerly was a hand operation.

Thomas H. Schelling, coordinator of work simplification in the power tubes at RCA, Harrison, an improved testing device for shorts in tube mounts.

Robert B. DeLong, process engineer, RCA Victor, Harrison, suggested an improved method of treating ingots.

R. A. Jacobus, engineer, RCA Victor, Harrison, suggested a changeover from trolley to sealex exhaust on certain special-purpose radio tubes.

Dorothy L. Sanderson, work simplifier, RCA, Harrison, developed a new mounting procedure for a high-production metal tube.

All told, RCA Victor workers have now won a total of 49 honors out of the grand total of 389 issued by the War Production Board. These include 14 certificates of individual production merit, 34 honorable mentions and one citation—the latter being the highest possible honor.

## Dogs Guard Plants



AS PROTECTION AGAINST POSSIBLE SABOTEURS AND INTRUDERS, RCA VICTOR DIVISION AT CAMDEN, N. J., EMPLOYS HIGHLY TRAINED DOGS TO AUGMENT THE STAFF OF 100 PLANT PROTECTION GUARDS.




TWO WAR HEROES, CORP. NICHOLAS LASTOHKIEN AND LIEUT. COM. MORGAN SLAYTON, HELP RCA VICTOR WORKERS RAISE THEIR NEWLY AWARDED TWO-STAR ARMY-NAVY "E" FLAG AT CAMDEN. AT THE LEFT ARE COMMANDER J. F. BATES AND GILES FRAZIER.

# 2 RCA PLANTS WIN "E" STARS

*Camden Gets Second, Harrison First Star Added to Army-Navy Emblems for Continued Splendid Achievement in Outstanding Production*

WITH the presentation of a two-star Army-Navy "E" flag as advance incentive, the RCA Victor Division's joint labor-management War Production Drive Committee in the Camden plant has launched its fourth "Beat the Promise" production drive.

Early in April, workers at the Harrison plant of RCA Victor were notified that they had been awarded the first star to be added to their Army-Navy "E" flag, which was presented last September.

In a letter addressed "To the Men and Women of the Harrison Works," Robert P. Patterson, Under Secretary of War, said:

"You have continued to maintain the high standard that you set for yourselves and which won you distinction more than six months ago. You may well be proud of your achievement."

The Camden campaign opened on the celebration of Washington's Birthday. "Let's Get It Over—Beat YOUR Promise" is the rallying cry of the drive designed to step up the output of vital radio, sound and electronic equipment. This slogan is emblazoned throughout the plant on posters, handbills and house publications. The plant-wide sound system likewise drives it home.

One of the highlights of the Washington Birthday program was the raising of the two-star "E" flag over the plant, following its presentation by Commander J. F. Bates, resident Naval inspector at the plant. The award was accepted for the employees by Arnold Weber, manager of the special apparatus division and chairman of the plant's joint labor-management committee, and Giles Frazier, vice president of Local 103, UERMWA, and vice chairman of the Committee.

In announcing the award earlier, Admiral C. C. Bloch, USN (Ret.), chairman of the Navy Board for Production Awards, said:

"I congratulate each and every one of the employees (of the RCA Victor Camden plant) upon their continued splendid achievement in outstanding production. This award is difficult to win in the first instance, and the requirements for renewal are equally exacting. By winning this additional honor, you have all demonstrated a solid determination to supply our fighting forces with the materials they must have to bring this war to a successful conclusion."



## NBC Aids Red Cross

*William S. Hedges (seated) NBC vice president, discusses with Mrs. August Belmont (right), Red Cross Council head, and Dorothy Stickney and Howard Lindsay, dramatic stars, script suggestions for the popular current broadcast series, "That They Might Live." The series is successfully promoting the Red Cross nation-wide campaign for nurses, nurses aides, and home nursing students to serve in the war emergency.*

# URGES CHARTER FOR BUSINESS

*Sarnoff Says Hope of American Prosperity, Security Depends Upon Government Cooperation with Industry, Labor, and Agriculture*

IN A PLEA for an American Charter for American business, David Sarnoff, President of the Radio Corporation of America, speaking February 4 at a meeting of the Chamber of Commerce of the State of New York, said that the great hope for American prosperity and security in the post-war period, depends upon Government cooperation with industry, labor and agriculture.

Pointing to the vital importance of science in global warfare, Mr. Sarnoff said that the degree of success in applying wartime developments to a new world in peacetime, will be controlled by social and economic forces over which science has no control.

"The achievements of science and industry hold out for us the promise of a great post-war prosperity," said Mr. Sarnoff, "but only if the individual enterprise of our citizens makes it a prosperity for all our people. Peace for only a segment of the globe and prosperity for only a section of our people will not be enough. Our constant efforts must be to make them universal. Neither industry alone nor labor alone nor agriculture alone can provide prosperity and security for all. But Government, which represents all of us, can, in cooperation with industry, labor and agriculture, help to make the entire nation prosperous and secure.

"The accomplishments of science and industry, expressed through the American competitive system of private enterprise, can be used to create employment for labor and for capital, and to stimulate national prosperity.

"The achievements of science in communication and aviation have wiped out geographical barriers, and have made the world a neighborhood in which no one's welfare can be separate from his neighbor's. When this war to save civilization is ended, there can be no peace for us as a nation unless there is peace in the world as a whole."

Discussing "Post-War Horizons," Mr. Sarnoff said that after all the treasure has been spilled across the battlefronts, enough potential resources will remain to feed, clothe and house the world's population. Looking ahead to the post-war era, he envisaged bread in place of bullets, and farm tractors in place of tanks, while cargo ships will carry products of farm and factory to millions needed by a world at peace.

There is no magic formula for the future, he said, and if global prosperity is the aim, it can be achieved only if global war is followed by global peace.

"Our hope for a future world economy of abundance is founded upon much more than pre-war standards of prosperity," continued Mr. Sarnoff. "It is based upon the promise of industrial science. The old frontiers of the world were frontiers of geography. The new frontiers are those of science. The covered wagon of the present day is the research laboratory.

"Progress in the field of radio and electronics has advanced on the same broad front with progress in other fields of science and industry. It is radio which has made possible a war of speed and mobility on land, at sea and in the air. Radio-electronic sentinels stand watch on shipboard and along the coast. The United States now has fighting forces stationed at more than sixty strategic locations on the world map. Its Navy operates on the Seven Seas. Without instant, reliable radio communication it would be impossible for these wide-spread forces to function as a unified war machine."

Referring to the radio tube as the heart of every radio instrument, Mr. Sarnoff said that science in putting electrons to work in the tubes has greatly extended the usefulness of electronics in industry as well as in communications.

"The versatility of these tubes, and of the devices built around them," he said, "is amazing."

# ENDURING PEACE URGED BY GENERAL HARBORD

*Warns Against Standing By and Watching Germany and Japan Rearm Again.*

PEACE made, when victory at last is won, must be a peace that will endure, Lieut. Gen. J. G. Harbord, Chairman of the Board of Radio Corporation of America, said February 17 at a dinner in his honor, held at the Union League Club. He declared that it must be made impossible for war-seeking leaders in Germany or her satellite countries to make war again.

"We must not once more make the mistake of standing calmly by and watching the re-arming of a Germany where militarism has been a cult since the Roman Era; or a Japan unbroken on 'through ages eternal' as the Japanese so proudly boast," said General Harbord, who was Chief of Staff of the AEF in the first World War, and at the end of the war was in command of the important Services of Supply.

"Our second thought, when peace eventually comes, should s t r i k e closer to home," continued General Harbord. "As loyal patriotic Americans we must do everything in our power—to the very limit of our power—to carry into the future our individual initiative, our self-reliance, and our political freedom. These heritages have created the strong stamina of our nation—these heritages have created the constantly increasing pace of its truly marvelous progress. America is made of such stuff!"

Reviewing the advances made in radio communication between the first World War and the present conflict, General Harbord said: "These again are great days for the scientists and engineers in the closely guarded laboratories of America, where new devices are being planned to be forged by industrial plants into the tools of victory.

"When victory is won at last, a great wealth of knowledge and skill and manpower will be ready to be turned from destruction to construction."

# RCA Gross Income Rose in 1942

CONSOLIDATED gross income of Radio Corporation of America for the year 1942 was $197,024,056, compared with $158,695,722 in 1941, it was stated in the company's twenty-third annual report, released by David Sarnoff on February 27 and mailed to 235,000 stockholders.

The report shows, after all deductions, a net profit of $9,002,437 for the year 1942, a decrease of $1,190,279 compared with 1941. After payment of Preferred dividends, earnings applicable to the Common stock were equivalent to 41.7 cents per share, as against 50.2 cents in 1941. Provision for Federal income taxes was $19,074,850 in 1942, an increase of $2,701,250 over 1941.

The sources of RCA's 1942 gross income were:

| | | |
|---|---|---|
| Manufacturing | $122,595,597 | 62% |
| Broadcasting | 52,613,910 | 27% |
| Communications | 14,497,197 | 7% |
| All other sources | 7,317,352 | 4% |
| Total | $197,024,056 | 100% |

Disposition of the year's income was as follows:

| | |
|---|---|
| Cost of Raw Materials, Supplies, Sustaining Program Talent, Rent, Sales and Advertising; Payments to Associated Broadcasting Stations; Research, Administration, and Other Operating Expenses | $ 92,267,770 |
| Wages and Salaries to Employees | 68,129,079 |
| Depreciation and Interest | 4,762,157 |
| Taxes | 22,862,613 |
| Dividends to Stockholders | 5,984,825 |
| Carried to Surplus | 3,017,612 |
| Total | $197,024,056 |

On December 31, 1942, the report stated, RCA personnel numbered 35,587, an increase of 5,126 in twelve months. Of this number, 18,746 or 53% were men, and 16,841 or 47% were women. At the year-end, 3730 RCA employees had joined the armed forces of the United States.

With the report to stockholders, announcement was made of the annual meeting to be held on Tuesday, May 4 at 11 A.M. in one of the NBC sixth floor studios.

## RCA'S TEN-YEAR RECORD OF EARNINGS

*(The figures shown for all years prior to 1941 include Foreign Subsidiaries)*

| Year | Gross Income | Net Profit Before Federal Income Taxes | Federal Income Taxes | Net Profit After Federal Income Taxes | Earnings Per Share on Common Stock (Based on present capitalization) |
|---|---|---|---|---|---|
| 1933 | $ 62,333,496 | $ *582,094** | —— | $ *582,094** | —— |
| 1934 | 78,756,994 | 5,055,114 | $ 805,850 | 4,249,264 | $.074 |
| 1935 | 89,228,898 | 6,026,673 | 899,800 | 5,126,873 | .137 |
| 1936 | 101,186,310 | 7,293,037 | 1,137,100 | 6,155,937 | .212 |
| 1937 | 112,639,498 | 11,142,158 | 2,117,300 | 9,024,858 | .418 |
| 1938 | 99,968,110 | 9,095,772 | 1,683,700 | 7,412,072 | .302 |
| 1939 | 110,494,398 | 10,149,511 | 2,066,700 | 8,082,811 | .350 |
| 1940 | 128,491,611 | 13,364,656 | 4,251,500 | 9,113,156 | .425 |
| 1941 | 158,695,722 | 26,566,316 | 16,373,600 | 10,192,716 | .502 |
| 1942 | 197,024,056 | 28,077,287 | 19,074,850 | 9,002,437 | .417 |

* Loss.

## NBC In Listening Survey

Results of one of the most comprehensive surveys of the radio scene ever conducted have been issued by the National Broadcasting Company. Two brochures, titled "A Tale of 412 Cities," present statistics on the listening habits of radio users in the 412 United States cities having populations of 25,000 or more. The supplementary folder, "A Report from the Nation," extends the survey to the entire country.

## To Redeem "B" Stock

The RCA Board of Directors, meeting April 2, voted to redeem on July 1, 1943, all outstanding "B" Preferred Stock of RCA, at $100 per share and accrued dividends to the redemption date, a total of $101.25 per share.

The 11,891 shares of "B" Preferred Stock now outstanding are the balance (less than 2 per cent) remaining after the recapitalization plan which went into effect in 1936. After July 1, 1943, the entire capitalization of RCA will consist of 900,824 shares of $3.50 Cumulative First Preferred Stock and 13,881,016 shares of Common Stock outstanding.

During a typical month of 1942, the National Broadcasting Company devoted an average of more than 5 hours of its own time daily to public service and war effort programs.

# *Sincerely Yours...*

WHEN the enemy struck at our country, American industrialists and business men, not content with their achievements of converting from peacetime to war production, turned the full power of their advertising, not only radio but publication advertising as well, to the gigantic task of bringing the war and its meaning to the American people.

Closely cooperating with the Government, they devoted, with characteristic energy and loyalty, time, money and great talent to the task of crystallizing the nation's thinking, to dispelling confusion and to clarifying the wartime duties of the individual.

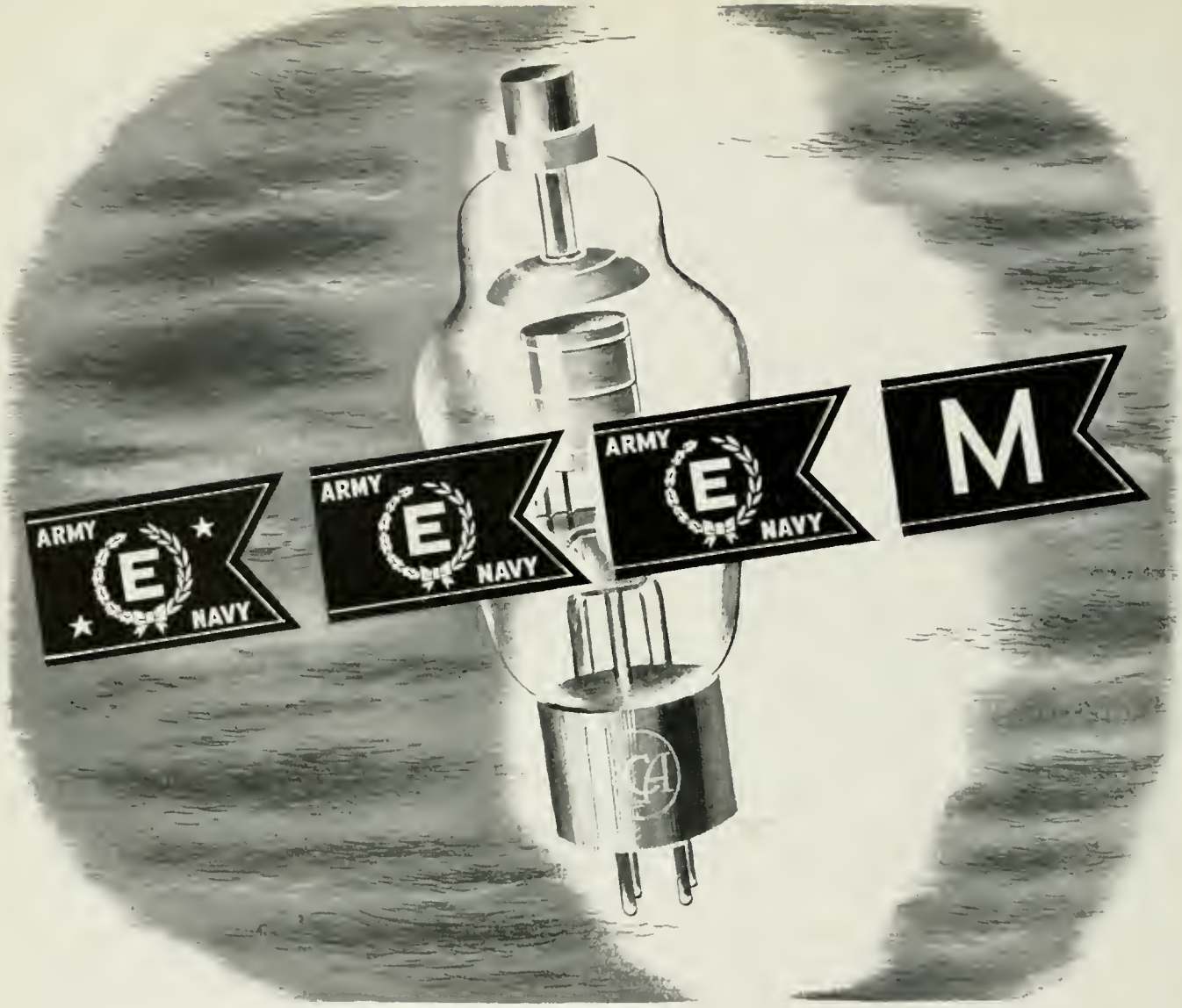
Advertising agencies, too, have utilized all their skill and experience in bringing about the fullest understanding of all the problems of war in a manner which has done much to unite the American people.

It is to these leaders of American industry, to executives, copywriters and artists of American advertising agencies and members of the Advertising Council, that the American people owe a debt of gratitude.

It is their advertising support, their war-effort and entertainment programs, which make possible a broadcasting service without equal in the world—a free radio for a free people.

To these men radio pays tribute—history will write "well done" to their magnificent contributions to the war effort.

• THE NATIONAL BROADCASTING COMPANY •




# Battle Flags of Radio...

These are flags of Victory — an Army-Navy "E" with two stars awarded to an RCA Instrument plant—an Army-Navy "E" won by an RCA Tube plant an Army-Navy "E" and the Maritime Commission "M" pennant awarded to the Radiomarine Corporation of America.

They have been won on a vital battlefront of this war—the battlefront of production. The men and women of the Radio Corporation of America and its services have earned these four flags by their outstanding achievement in the production of radio-electronic equipment vital to victory.

When victory is won, the skill and war experience of RCA will be turned to the new goals of peace . . . to the task of making the life of our nation richer, safer, more enjoyable, and more productive . . . through new and finer products of radio and electronic research.

★ BUY WAR BONDS EVERY PAYDAY ★

## RADIO CORPORATION OF AMERICA

**RCA LEADS THE WAY IN RADIO, ELECTRONICS, TELEVISION**

*The Services of RCA:* RCA Laboratories • RCA Victor Division • R.C.A. Communications, Inc.
Radiomarine Corporation of America • National Broadcasting Co., Inc. • Blue Network Co., Inc. • RCA Institutes, Inc.

# RADIO AGE

RESEARCH · MANUFACTURING · COMMUNICATIONS · BROADCASTING

Public Lib
Kansas City,



RCA

JULY

1943




# Two jobs we can all be proud of

Our big job at RCA is War Communications. Some of us are making the equipment without which no modern fighting force can wage total war. Others of us, in the NBC end, are using some of that equipment to inform, to entertain, and to inspire Americans in and out of uniform.

BUT THERE'S another vital war front that needs protection—and now! Planning the Peace is actually part of our war job. Obviously, we Americans at home can't let down our millions of fighting men—we must make this country something really nice to come home to. And just as important—we can't let our war-production forces at home drift aimlessly once the delirious joy of the coming peace celebration is over.

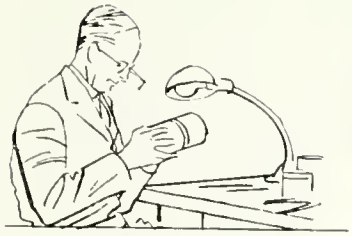
SO WHAT IS NBC doing about it? We happen to be the largest, and most effective "Round Table" in the world. We take that fact as a serious responsibility. Because of it, the people of America can "sit in" at meetings on Peace Plans. Through NBC facilities, America can formulate its ideas on winning the peace in the true spirit of democracy.

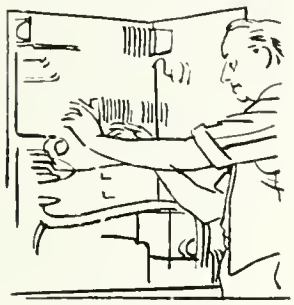
"FOR THIS WE FIGHT" is a new program that puts into action our NBC policy of "Telling the people."

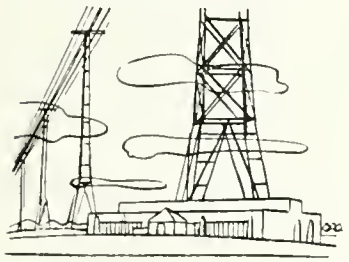
SATURDAYS at 7 p. m. EWT, America listens to the post-war ideas of men such as: Cordell Hull, Sumner Welles, Justice Owen Roberts, Elmer Davis, Thomas W. Lamont, David Sarnoff, Matthew Woll, Senators Thomas and Austin, Nelson Rockefeller, and many others.

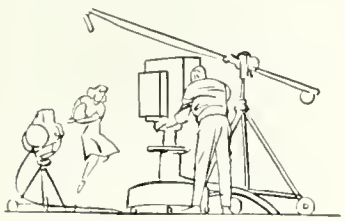
NBC SALUTES the cooperation and public spirit of those distinguished Americans who are making "For This We Fight" an important contribution to post-war planning. And, since this is strictly in the RCA family, we can all take a modest pride in being first in radio with a program so definitely in the public service.

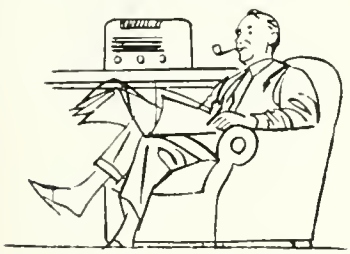
*The National Broadcasting Company*











COVER—This fine picture of the American Flag, a photograph by Gray O'Reilly, is reproduced by RADIO AGE through the courtesy of the Woman's Home Companion.

# RADIO AGE

RESEARCH · MANUFACTURING · COMMUNICATIONS · BROADCASTING

VOLUME 2 NUMBER 4
JULY 1943

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UPON THE OCCASION OF THE PRESENTATION OF THE ARMY-NAVY "E" AWARD TO RCA LABORATORIES AT PRINCETON, N. J.: LEFT TO RIGHT, SEATED, REAR ADMIRAL HAROLD G. BOWEN, USN; LIEUT. GEN. JAMES G. HARBORD, USA (RET.); GOVERNOR CHARLES EDISON OF NEW JERSEY, AND, STANDING, DAVID SARNOFF AND MAJ. GEN. ROGER B. COLTON, USA.



# RADAR—Wartime Miracle of Radio

THE war has put a new word in the news. It is Radar, which means radio detecting and ranging.

ra *radio*
d *detection*
a *and*
r *ranging*

The letters r-a-d-a-r spell the same forward and backward. This gives a clue to its performance in using the radio echo, which is reflected by any object which the radar beam strikes. An airplane, for instance, acts as a "radio mirror" when it is intercepted by a radar beam.

In the United States, through foresight and encouragement as well as through their own scientific research, the Army and Navy played a vital part in cooperating with the American radio industry in the development of radar long before the war.

To give the American people "as much information as possible without endangering our own forces or helping the enemy," the Army and Navy in a joint release on April 25, 1943, defined radars as "devices which the Allies use to detect the approach of enemy aircraft and ships, and to determine the distance (range) to the enemy's forces."

The statement continued: "Radar is used by static ground defenses to provide data for anti-aircraft guns for use in smashing Axis planes through cloud cover, and by airplanes and warships. It is one of the wonders made possible by the electron tube.

"Radar is used for both defense and offense. In fact, the British, who call their similar apparatus the radio locator, say it was instrumental in saving England during the aerial blitz of 1940 and 1941. At that time the locators spotted German raiders long before they reached a target area, and thus gave the RAF and ground defenses time for preparation. Since then radar has stood guard at many danger points along United Nations frontiers and at sea, warning of the coming aerial and sea-borne enemy forces, and contributing toward victory in combat. The new science has played a vital part in helping first to stem and then to turn the tide of Axis conquest."

As a vivid illustration of radar's effectiveness in the hands of America's armed forces, James F. Byrnes, Director of War Mobilization, in an address broadcast from Spartanburg, S. C., said:*

"History will some day record the part radio and the radar have played in giving us fighting superiority over the Axis. But let me give you one instance. On the night of November 14, off Guadalcanal there lay a Japanese battleship. It was a stormy night. Eight miles away was a ship of our fleet. With the use of the radar our ship with its second salvo sank the Jap battleship in the blackness of night, eight miles away."

Helping to pave the way for such triumphs, the Radio Corporation of America as early as 1937 delivered experimental radar apparatus to the U. S. Army Signal Corps for aircraft location tests. RCA also produced, for the Signal Corps, portions of its first radar equipment, such as was in operation at Pearl Harbor.

A set of radar, designed and manufactured by the Naval Research Laboratory, was installed on the U.S.S. *New York*, late in 1938. At the same time RCA had built for the Navy an experimental radar equipment which was tested on the battleship *New York*. As a result of the tests, the Navy decided to develop additional radar sets, and in October, 1939, because of RCA's pioneer radar work, it was awarded contracts for six sets of aircraft detection equipment patterned after the original model built at the

* May 31, 1943.

Naval Research Laboratory, and as installed on the U.S.S. *New York. This was the first Navy service radar equipment order. The apparatus built by RCA was installed on U. S. naval vessels beginning in 1940.*

Basic research work on apparatus and techniques for the locating of ships and planes by radio had been instituted by the Radio Corporation of America as early as 1932, when experimental equipment was constructed. Apparatus completed in 1934 was used for a series of cooperative reflection tests with the U. S. Army Signal Corps. Immediately, the Army indicated an interest in the possibilities of developing apparatus for detection of aircraft and ships.

Encouraged by this response, RCA Laboratories continued tests to determine what performance might be expected. The early apparatus, with further development and improvement, indicated possibilities of much better performance than the sound locators then in use. By demonstrations and discussions, the Army and Navy were kept in touch with the RCA research. In view of the possible military applications, no publicity was given to this development.

During 1937, operating equipment was completed and tested, indicating the direction and distance of reflecting objects, in much the same form as is now used in a large part of modern radar equipment. These developments had grown to such importance to the military services during 1937, that RCA was requested to put all of this work on a secret basis.

What was probably the first application of radar principles to aviation was achieved by RCA through equipment built and installed in its own plane in 1937, in connection with research on collision prevention apparatus. Many flights were made testing this apparatus during 1938 and 1939, showing the effectiveness in warning of collision between aircraft, or between planes and mountains, or other obstacles. This equipment not only determined the altitude with accuracy, but was found able to detect objects ahead at a sufficient distance to warn of an impending collision. Owing to the close relationship between this apparatus and aircraft detection equipment, commercial announcement of these results was not possible.

"There is no question but that radar has changed the whole course of history," Rear Admiral Harold G. Bowen said when he spoke at the Army-Navy "E" Award ceremonies at RCA Laboratories.* His contact with the development of radar in the United States Navy goes back to October 1931, when he served as Assistant Chief of the Bureau of Engineering. As Director of the Naval Research Laboratory at Anacostia, D. C., he was designated Coordinator of all phases of the Navy's radar program in October 1940.

Reiterating that the Battle of England was won because the British had radar of their making to prevent the Germans from surprising the British planes on the ground, Admiral Bowen said "you can be assured that radar has played a highly significant role in our successful operations to date.

"Ever since the invention of radar, the Navy and the great electronic laboratories have been in constant and fruitful contact," he continued. "Our associations with RCA in this respect have been of long duration and most satisfactory. Of the first two radar sets that were sent to sea in 1938, one was manufactured by RCA and the other by the Naval Research Laboratory. The great progress of radar in the Navy and its gradual acceptance as a new fundamental contribution to war, dates from that time. The first sets purchased by the Navy from a commercial concern were six in number and were supplied by RCA.

"The story of radar is such an astounding story that it is regrettable that all the history of this development cannot be made public at this time. In the history of technology, no art has ever developed so rapidly and no art was ever prosecuted at the same time in all branches—namely, research, development and production. Certainly no such complex art was ever brought to a state of usefulness so soon. This fact, of course, was due not only to the position of technology in the United States, but was also due to—first, the threat of impending war, and later, the war itself.

"The training of personnel to handle this new equipment was almost as great a task as the development of the equipment itself. Scientists who could not be spared from their work had to be used to operate the first sets aboard ship because no one else knew how to operate them. Schools were required to train operators and maintenance men.

"The whole electric and electronic industry and all of its labo-



*June 17, 1943 at Princeton, N. J.





ratories have played their part in this phenomenal story. Only in the United States could such a phenomenal development proceed so rapidly and result in such phenomenal production," said Admiral Bowen. "The greatest tribute is due the many who worked for so long in silence in so many laboratories to make it possible that the results of this development could be utilized in time to obtain a definite military advantage over our enemies."

Does the enemy know about radar? The fundamental principle is no secret. In fact, a main objective of one of the first Commando raids along the French coast on February 27, 1942, was to capture intact the equipment of a radar station at Bruneval, north of Havre—the mission was successful.

Aiming to cripple one of Germany's key defense weapons against land invasion and against Allied air attacks, RAF 4-motored Lancaster bombers on June 21, 1943, made a heavy raid on the radio-radar factory in Friedrichshafen with 500-pound bomb hits on all main buildings.

It has since been revealed that for many years America has been at the forefront of radar development, but because the war struck Britain first, it was there that this new aerial watchdog received its baptism of fire. Radar was rushed into action, and the British are rightly praised for having done a magnificent job in quickly applying this great weapon to prevent the Luftwaffe from striking a knockout blow. Nazi fighter bombers have tried in vain to sneak by the radar patrols to reach England by flying low, skimming the water in hopes that the beams might be sweeping the skies overhead and therefore miss them.

Lord Beaverbrook, Minister of State, in a broadcast appeal for volunteers to man the radio locators in England, said:

"It is the radio that destroys the enemy in the darkness, that seeks him out through the clouds. It is the radio that sends the avenging fighter to the place where he will meet the lurking enemy and bring him to destruction. . . ."

Radar, as is often the case with new scientific developments, sounds mysterious and complex. Yet there is a simple explanation of its principle that reveals how its magic is performed. A simple illustration is found in the echo.

The boy, who yoo-hoos at a cliff and hears the echo, is in effect illustrating the radar principle. The sound strikes an object and is reflected. Radio also has echoes. But, of course, radio travels much faster than sound; it travels at the speed of light, 186,000 miles a second. Knowing the speed of sound and light, also the time elapsed before the echo is heard, distance can be measured. For instance, knowing the velocity of the radio wave, and by recording the time required for the echo to come back, the distance to the object that reflected the signal can be determined.

The speed of the radio waves, however, is so great that it is only by the development of modern electronic devices that this measurement has been made possible. For instance, the time required for a radio wave to travel to an object 50 feet away and back again is only one ten-millionth of a second, yet radar can measure it.

The wonder of it is that out of the electromagnetic power "searchlighted" into space, the infinitesimal bit that may be reflected from an airplane—a mere speck in the sky—can be detected as an echo. It bespeaks high tribute to the radio tube designers who have created the means of projecting powerful beams into the sky. And at the same time they have been able to produce receiving tubes of sufficient sensitivity to record the reflection of a plane as it flies through the invisible beam.

Radar, an important milestone in the evolution of radio, is no overnight development. Years of exploration of the ether—pioneering that opened up the ultra-short wave spectrum—are behind it, as well as research and engineering in radio circuits, special electron tubes, and the application of electronic techniques. Fortunately, science was ready when the frantic call went out for a device to combat the war plane. Radar came to the rescue.

Twenty-five years of peacetime scientific developments since 1918 have been marshalled into service to help win the Second World War. Veteran sailors marveled at the radio direction-finder of World War I. However, the old type of direction-finding has always required that the ship or plane to be located had to be transmitting a radio signal. Through the development of radar, vessels or aircraft can be found whether or not they are emitting radio signals. In the new form of radar direction-finding, position and distance may be determined without the cooperation of the object, the location of which is being determined.

Great has been the advance in this art of radio since the radio compass won fame at the Battle of Jutland, and aboard the NC-transatlantic flying boats on their historic hop across the sea in 1919. Radar is new magic.

In recent years there have been a number of radio scientists and engineers whose work has been directly concerned with putting radar together and in the development of components that made it practical. The basic researches of Dr. A. Hoyt Taylor, Leo C. Young, L. A. Hyland, Robert M. Page, Louis A. Gebhard, and M. H. Schrenk of the



U. S. Naval Aircraft Radio Laboratory, Anacostia, D. C., in studying the Heaviside surface and radio echoes, added much knowledge that helped to open the way to radar. Gebhard, a veteran in wireless, who served in the Navy in the First World War, is credited with outstanding work in development of radar transmitters, embodying electronic principles.

Major General Roger B. Colton as Executive Officer and later as Director of the U. S. Army Signal Corps Laboratories at Fort Monmouth, N. J., early realized the possibilities of radar and contributed much in fostering development of the new device for military purposes.

Indicating the usefulness of radar to the Army, Major General Dawson Olmstead, then Chief Signal Officer of the Army, reported to the House Appropriations Committee:*

> In the battle of Attu in Alaska, when our forces arrived and wanted to get men ashore in small boats, the weather made visibility so bad that the water could not be seen from the deck of a ship. The ships were berthed and the men landed by the use of radar.

Many research workers and engineers of RCA Laboratories have contributed to the radar program through the development of integral parts. The first steps were taken many years ago, when a program of research was instituted in the ultra-short wave radio spectrum, with emphasis on apparatus and techniques that would broaden the usefulness of radio service. This work led early into experiments with reflections of radio from objects, and soon thereafter into radar. Ever since this pioneering period, Dr. Irving Wolff of the Laboratories has been associated with research work on many forms of radar, and much of this research has been under his direct supervision.

During the early work, Rene A. Braden and Dr. E. G. Linder were associated with Dr. Wolff and developed the apparatus used for the reflection tests. Later, George W. Leck joined the radar research group and has continued in this work. When the aircraft project began, Dr. W. D. Hershberger, R. M. Smith and C. E. Hallmark undertook this phase of the development.

Following the early research results, RCA engineers began the development necessary to make equipment ready for practical use. The group responsible for this and for engineering the first service radar equipment included John B. Coleman, J. Edwin Love, John E. Evans, C. A. Gunther, George Charrier and L. J. Wolf.

In the course of its development, many other RCA engineers have made notable contributions to radar. When secrecy restrictions are lifted, it will be possible to reveal some of the results and to give credit to the men who achieved them.

Thus the American radio industry, as the War Production Board has pointed out, has produced "the once-secret weapon which provides data to aim a gun accurately on a distant enemy plane invisible to a telescope."

What of radar's future? Does it have peacetime applications?

Commending the scientists and engineers of the Radio Corporation of America for the vital part they have played in the development of radar, and in producing it for the Nation's use at a time when it was essentially needed, David Sarnoff, President of RCA, told them that RCA is proud of their achievement.

"Television and radar add new dimensions to radio," said Mr. Sarnoff, "wireless telegraphy was its first dimension and broadcasting its second. Application of these new developments of radio to peace, opens new fields of service on land, at sea, and in the air.

"Radio instruments will emerge from the war almost human in their capabilities. They will possess not only a sense of direction, but a sense of detection that will open new avenues of service. The radio direction-finder, which heretofore had only an ear, now also has an eye. The safety of aviation will be greatly enhanced for the aviator will be able to see the ground through clouds or darkness. By the scientific application of the radio echo, the radio "eye" will avert collisions, while the radio altimeter will measure the altitude and warn of mountains ahead or structures below.

"American inventive genius has contributed much to the creation and perfection of radar as a great offensive and defensive weapon. I am happy to report that RCA Laboratories have been in the forefront of radar research and development. The radio-electron tube was the key to its application. I believe it now can be said that by the use of radio and especially radar, the United Nations have been able to avert many disasters, save precious lives, and inflict severe damage upon their enemies."

*June 18, 1943



# Radio on the "Rack"

*MODERN INDUSTRIAL ENGINEERS AT RCA-INDIANAPOLIS DEVELOP TORTURE CHAMBER TO TEST WAR-VITAL COMMUNICATIONS UNITS*

THE notorious Iron Lady of the medieval torture chamber, together with such devices of torment as rack, wheel, and thumbscrew, have nothing on the ingenious devices which modern industrial engineers have developed to put vital radio and sound equipment through their pre-battle paces.

Deep in the basement of the Indianapolis plant of the RCA Victor Division of Radio Corporation of America, situated like the dungeon of a castle, this modern "torture chamber" is the daily scene of harrowing trials by water, fire, submersion and shock—all in a good cause.

The victims are communication equipment, parts of radio apparatus, and sample materials under consideration for use in manufacturing radio, sound and electronic devices for the armed forces. The "executioners" are skilled radio engineers.

RCA Victor's torture chamber grew out of the Navy Department's need for equipment that could withstand the most strenuous use under virtually all conditions of climate and battle. These requirements demanded rigid, uncompromising tests to insure that this important communication equipment, destined for battle service in the air, on and under the seas, meet the Navy's specifications.

The subterranean chamber houses many ingenious devices especially contrived by Navy and RCA Victor engineers to simulate battle conditions, which the equipment will be called on to withstand and through which it must operate perfectly. Since this equipment may see service on any continent and on and under the seven seas, RCA's engineers are confronted with the responsibility of designing equipment dependable in almost any conceivable set of operating conditions.

The torture devices (more politely called test equipment) permit engineers to observe how the equipment withstands punishment and eliminates the guess work from the question of how a piece of equipment or its materials will stand up under virtually any battle or climatic conditions to be found anywhere on the globe.

In the confines of the chamber, a piece of apparatus may be given a normal life time of service—within a single week. It is made to operate at temperatures as low as 40 below and as high as 260 degrees above zero. It may be made to function in man-made humidity rivalling the tropics or the blistering dry heat of a desert; under conditions of vibration and shock such as caused by bombs or cannon fire; in a salty atmosphere simulating waves dashing over the bridge of a ship; 40,000 feet up in the air, or 600 feet beneath the surface of the sea.

"Simulating these actual conditions," explains William J. Morlock, engineer in charge of RCA Victor's test development section, "the future behavior of the equipment and material can be accurately predicted. Thus the weaknesses of any equipment are discovered before manufacturing in quantity is started."



SHIPBOARD INTERCOMMUNICATION UNIT BEING BROUGHT FROM "TORTURE CHAMBER'S" WEATHER ROOM, WHERE IT OPERATED IN 140-DEGREE HEAT.

As might be imagined, mayhem of no mean proportions is inflicted upon the equipment in the torture chamber. It is thumped, shocked, beaten, frozen, broiled, submerged, shaken, bounced, and all but boiled in oil.

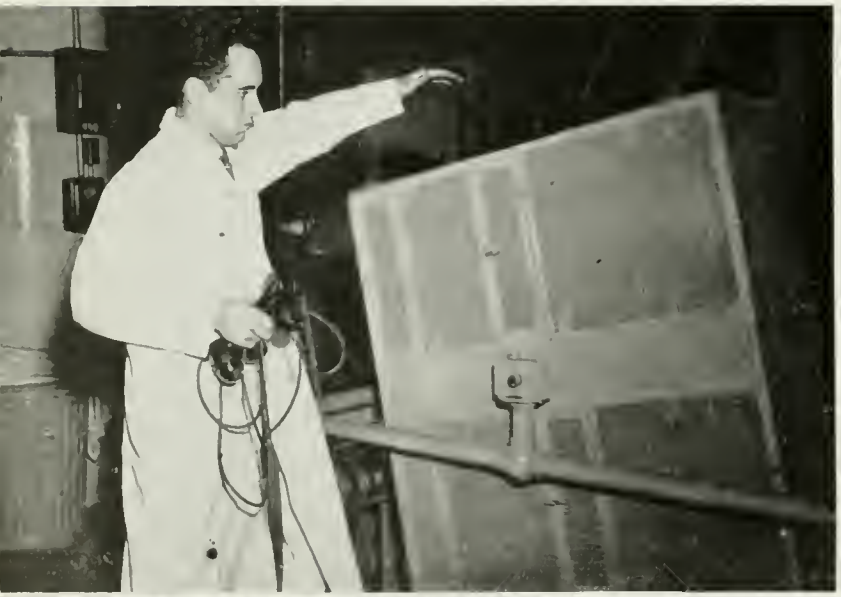
Perhaps the most spectacular, though not the most violent, device in the torture chamber is the splash tester, which simulates rain or violent waves of water. Designed by Ray A. York, development engineer at the Indianapolis radio plant, who presides over the torture chamber, it is modelled after a shower room, but with a backboard where the



OUT OF A SPECIALLY CONTRIVED ICE BOX, WHERE THE TEMPERATURE DROPS TO 40 DEGREES BELOW ZERO, IS LIFTED THIS TRANSMITTER STATION.



COMMUNICATION EQUIPMENT IS SUBJECTED TO THE POUNDING OF A SLEDGE HAMMER (ABOVE), SIMULATING GUN RECOIL. IN THE "TUMBLER" TEST (BELOW), A ROTATING BOX IN WHICH RADIO AND SOUND UNITS MAY BE DROPPED 1,000 TIMES, IS USED.



equipment is placed. A revolving hose directs a stream of water around the equipment. The nozzle is regulated so that the water may be made to fall in a gentle sprinkle or at a 55-mile per hour blast, duplicating the breaking of waves against the ship while a storm is raging. Some form of this test, according to York, is given to nearly all equipment to be exposed to the elements.

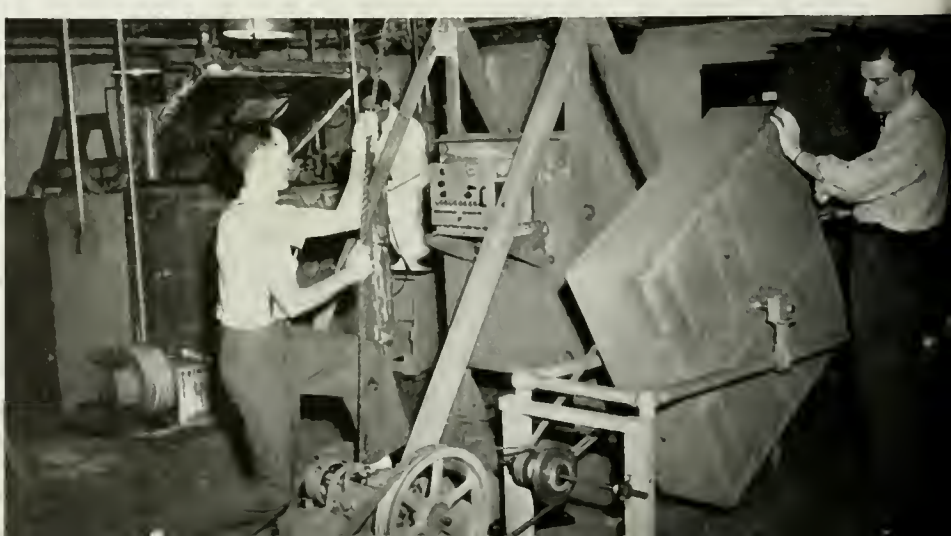
Some equipment is also given the submersion test, designed by the U. S. Navy to test water-tightness. In this trial by water, the equipment remains for two or three hours in a tank of water and is tested under submerged conditions.

In some cases, the equipment undergoes an even more fanciful bit of torture in the high pressure test, also conceived by Navy engineers. Here the equipment is submerged in water in a pressure chamber, taken down to pressures equivalent to a depth of 600 feet, in order to check the equipment as to its ability to "take it".

According to York, the most popular corner of the torture chamber is the "weather room". This room is large enough to accommodate complete equipment and its operating personnel. Here equipment under test takes a beating from heat waves and cold spells, since temperature and humidity can be regulated over a wide range. Twenty-five thermo-couples measure the temperature of each component of the equipment and the tendency of any part to over-heat is observed.



IN THE PRESSURE TEST (LEFT), SOUND COMMUNICATIONS EQUIPMENT IS "LOWERED" TO THE EQUIVALENT OF 600 FEET OF WATER. THE INGENIOUS DEVICES IN THIS CORNER (BELOW) OF THE "TORTURE CHAMBER" AT RCA'S INDIANAPOLIS PLANT SHOW THAT THE ROOM IS APTLY NAMED.



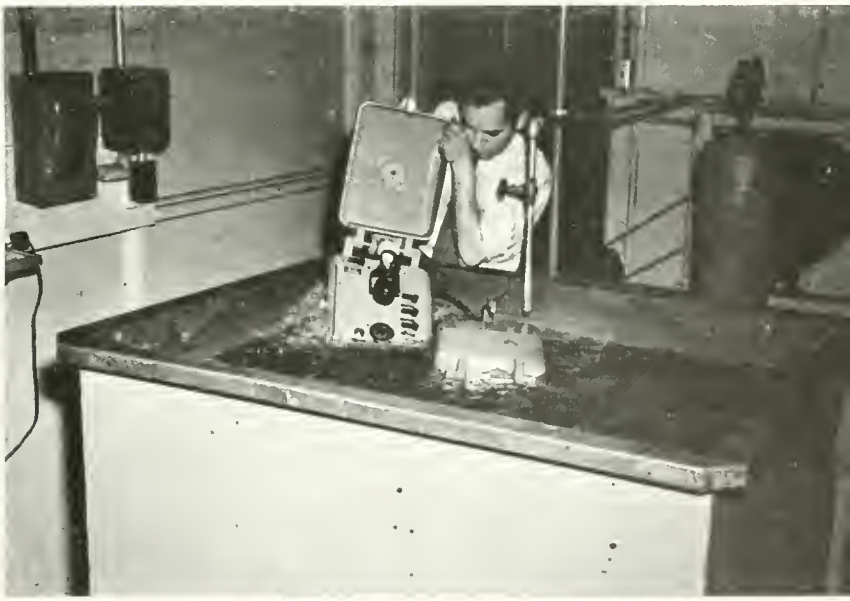
For sheer brute torture the chamber boasts the shock test. This simulates gun recoil conditions which communication equipment must be able to withstand. The shock is applied by a heavy sledge hammer, which delivers a mighty blow against a heavy wooden board, on the front side of which the equipment under test is fastened. After twenty or more such blows are delivered to the operating equipment, it is checked to be sure that it has withstood this gruelling punishment.

Still another ingenious instrument of "torture" designed by Engineer York is his salt spray tester. Reduced to human terms, it is nothing more or less than continuous series of severe cases of sunburn after ocean bathing. Technically, it was designed to determine whether paint finishes on equipment can withstand salt corrosion. The equipment is given a three-minute salt spray, followed by a three-minute hot air blast. This cycle is repeated 100 hours during which ultra-violet ray, representing the sun, is shining on the equipment.

These are the feature attractions of RCA Victor's aptly called torture chamber. After a piece of equipment has passed through these gentle devices, and has survived, it is ready for quantity production and for use on the war front.

"No battle condition," remarks York, "could hold a candle to such tortures."





SALT SPRAY AND ULTRA-VIOLET RAYS PLAY ON NAVY COMMUNICATIONS EQUIPMENT IN THIS TEST (ABOVE) TO DETERMINE ITS CORROSION RESISTANCE. EQUIPMENT IS CHECKED FOR WATER-TIGHTNESS AFTER IT HAS BEEN SUBMERGED IN A LARGE TANK (BELOW) FOR A NUMBER OF HOURS.

BECAUSE NAVY TELEPHONES MUST NOT FAIL AT CRUCIAL MOMENTS, THEY ARE TESTED (RIGHT) UNDER SIMULATED STORM CONDITIONS. IN THIS SCENE (BELOW), SHIPBOARD COMMUNICATIONS EQUIPMENT IS UNDERGOING A 55-MILE-AN-HOUR BLAST FROM A WATER HOSE IN A SEA-WATER SPLASH TEST.





# Lower Distribution Costs Sought

*RAPID EXPANSION OF NEW MARKETS, MORE EFFICIENT METHODS OF DISTRIBUTION OF INDUSTRIAL PRODUCTS ARE AIMS OF SCIENTIFIC COMMERCIAL STUDIES MADE BY RCA RESEARCH GROUP*

By E. W. Butler, Manager,
*Commercial Research Dept., RCA Victor Division*

EVERY time someone asks us what we do in the Commercial Research Department I get a little concerned about whether they fully understand the meaning of that word "research". Research is usually associated with test tubes, Bunsen burners, electrical laboratories, and lots of complex apparatus. But "research" isn't limited to the technical field. In fact you can "re" search or take a second look to pretty good advantage in a great many parts of your business.

Commercial research people are just ordinary commercial people who go about the job of taking a second look at our commercial problems. We define commercial research as the procedure of obtaining facts on which to base decisions.

We do not employ any crystal balls, fortune tellers, or clairvoyants. We do not attempt to predict when the war will end, or whether Dick Tracy will escape from his latest predicament. Similarly, there are many business problems which management cannot answer now. Some people believe that the immediate post-war era will witness the greatest boom known to mankind. Others think unemployment and high taxes will create a chaotic depression. The study of other factors, like inflation and free trade or high tariffs, can give you almost any answer you wish to prove.

In spite of these many perplexing questions, there are some sound conclusions which the business executive can get through research. That is, he can reach some sound conclusions if he will stop long enough to obtain facts and conduct tests through scientific procedures. Until now, the selling end of most businesses has lacked the same rules and systematic procedures that have been accepted in accounting, manufacturing, and engineering. *It was to eliminate the use of personal opinion and substitute proved facts in policy-making that the management of our company set up a Commercial Research Department a little less than three years ago.*

We have great confidence in the post-war period, and the things we are doing are designed to help our company take full advantage of what may be the most interesting time in our country's history. For example, we believe that retail prices must be lowered and that this lower price must be obtained largely through reduced costs of distribution.

We know that we shall have many new products and that new markets can be opened for both old and new products. We believe that competition will be stronger and more aggressive and that our own sales methods must be revamped to cope with these new conditions.

But it is one thing to talk about lower prices and new markets and it is another thing to do something about them. Doing takes "know-how" and that is where Commercial Research fits in. We are trying to find out the "how" of our post-war job.

Perhaps you may wonder why RCA's Commercial Research Department is headquartered in Chicago when our home offices are located in New York and Camden, N. J. The explanation is simple. We market our consumer products through approximately eighty wholesalers and 15,000 retailers. Most of these distributors and all of the dealers represent independent capital. In Chicago, however, we have our own distributing house, with branches at Kansas City and Detroit. These are our only company-owned distributing points in the country.

It was recognized that Commercial Research needed a laboratory—not the kind of laboratory mentioned before with test tubes and Bunsen burners, but a practical sales laboratory where we could actually test our theories on lower distribution costs. To practice these theories on an independent distributor might not be too healthy, but there could be little wrong with trying out new ideas in a company-owned wholesale house where we have our own money invested. That is how we came to locate our commercial research activities in Chicago—in order that we might have a company-owned distribution unit at our disposal where we could put theories to actual test.

The success of stores following a simplified and economical pattern as exemplified by the voluntary or corporate chain is ample evidence of what can be done by streamlining distribution. Any manufacturer, like ourselves, who markets his goods through wholesalers and retailers finds a difficult problem when he sets about to see what can be done to reduce the cost of distributing his products. You cannot just say to these wholesalers and retailers that you have decided to cut the cost of distribution and therefore proceed to cut their discounts. Instead, you should know what constitutes an economical operation and what profit margin is required for such an operation.

Therefore, we are trying to determine through careful and painstaking study how to make our distribution more effective and less costly. We are conducting experiments to find out how to conduct a wholesale distributing business at the lowest possible cost commensurate with good service. This work includes time and motion studies exactly like those performed on the manufacturing production line. We have mechanized many operations in our warehouses; we have orig-

inated some new approaches to inventory control; and we have made considerable progress in streamlining accounting methods and eliminating unnecessary reports.

These theories have been put into actual operation and it is our objective to have a model pattern for distributor operation in the post-war period. We are also applying this same type of thinking to the problems of retailing our products. As a matter of fact, we have developed a pattern for self-service merchandising of records which is actually operating in one of the large Chicago department stores. Our tests with this super-market for records leave no doubt that the public likes the self-selection method of shopping for records. We have obtained material increases in sales volume over what this same department store got last year and over what other stores operated by the same company are now obtaining. It is quite possible that in the post-war period you may find record super-markets just like your grocery stores of today.

We are also getting acquainted with our ultimate consumer. For example, we conducted a nation-wide survey of record buyers in which we interviewed more than 4,300 customers immediately after they had made a purchase. We found out what they had purchased, of our products as well as our competitors' merchandise; why they had purchased it and where they had heard about this particular record; how they had asked for the merchandise and how the clerk had responded, etc. So we are beginning to know the buying habits of our customers and how better to meet their needs.

We are also studying new markets that we may wish to reach after the war. Just as an example, one of our men spent almost a full year on an important railroad system, studying railroad methods and the possibilities of improving railroad efficiency or safety with the help of RCA products—present or future. On this assignment, he satisfied the ambition of every small boy of riding in the cab of a locomotive. By working in cabooses, in classification yards, in dispatchers' offices, in fact all over the system, he learned quite a bit about the railroad business and about its problems.



THIS MODEL SELF-SERVICE SHOP FOR PHONOGRAPH RECORDS, SET UP IN A CHICAGO DEPARTMENT STORE, IS UNDER EXPERIMENTAL DEVELOPMENT BY RCA VICTOR'S COMMERCIAL RESEARCH GROUP.

So, in the post-war period it is possible that radio and other RCA radio-electronic products can find a new market in the railroad field. All of the information has been completely written down and is filed away for the day when we resume normal commercial activities. We are expanding these studies, too, into other fields. For example, we are just now starting on the packing industry. If planning can do the job—and we think it can—we are going to make a contribution toward keeping those plants busy that are now producing war materials.

Another section of our research deals with new products. Numerous new developments will be available for commercial use when this war is over, but before these new products can be put on the market it is necessary for management to know where the market is, how much volume can be anticipated, what prices are necessary to do a volume business, what styling will have the most appeal, etc. So Commercial Research is undertaking to study these new markets, in order that we may take full advantage of them in the post-war period.

Our business prior to the war was built predominantly on merchandise for the *home*. Because of the new products that have been developed in recent years there is every indication that *industry* will rank as our most important customer after the war. Generally speaking, we are much less familiar with selling merchandise to industry than we are with selling consumer products through wholesalers and retailers. Therefore we have set up a "test" selling procedure in one of our sales territories, which will get us the answers to this selling problem.

At the beginning of this story I said that the job of commercial research is the procedure for obtaining *facts* on which to base commercial decisions. It may strike you that we are going to a great deal of trouble and expense to dig up these facts and test our ideas. That is true, but it seems to be the only way to develop better methods, which will pay off in terms of more efficient distribution.

# "For This We Fight" Looks Ahead

*SERIES IN NBC UNIVERSITY OF THE AIR BRINGS TO MICROPHONE EMINENT LEADERS FROM ALL WALKS OF LIFE TO DISCUSS FUNDAMENTAL PROBLEMS FACING PEOPLE WHEN WAR ENDS*



By Dr. James R. Angell

*Public Service Counselor*
*National Broadcasting Company*

THE radio program "For This We Fight", which the National Broadcasting Company started on the air June 5, may fairly be regarded as a landmark in radio history and indeed to some extent in our national history itself. Certainly it represents, so far as we are aware, the first time that during a great war a medium has existed which could bring directly to our citizens discussions of post-war aims and hopes by many of the country's most distinguished authorities. As planned, the series should enable citizens, literally by hundreds of thousands, to participate directly in organized discussions about the kind of world that they desire for the future.

The last great war left us a terrible object lesson of what may occur in a Republic like our own if the great mass of citizens have not been disciplined to face and understand the peculiar problems which are created for all mankind at the conclusion of such a cataclysm. However much men may desire it, it is utterly impossible to go back at once or, indeed, to go back at all to the conditions which existed prior to the war. It therefore becomes imperative that intelligent thinking should be early devoted to an analysis of the problems which will inevitably have to be faced both at home and abroad when the present war comes to an end.

This does not mean that anyone lays claim to the ability to foresee exactly what is going to occur. Unavoidably, there is a wide area of uncertainty which only the event can resolve. Nevertheless, there are many aspects of the post-war issues whose existence can be confidently foreseen and for which it is therefore the part of common-sense to attempt to prepare. Moreover, there are many facts about those nations of the world which of necessity must participate in determining the character of the peace, with which it is highly important that our people should begin to acquaint themselves.

In lesser degree only, the same thing is true of our domestic problems. Most of us are painfully familiar with our own personal difficulties and not a few are aware of the perplexities faced by our communities, but relatively few of us have a truly national picture in mind and, in consequence, we are inevitably somewhat provincial in the attitudes which we take toward the larger domestic issues.

The radio series which is now in question comprises a conscientious and thorough-going effort to bring out into the open in the most objective and non-partisan manner possible all the fundamental perplexities with which we shall be confronted the moment the fighting stops. Not only are we bringing to the microphone eminent leaders from every walk of life and from every part of the country to present their views on these issues, but we are also cooperating with two organizations which are peculiarly equipped to assist the nation in facing these problems.

Among the distinguished persons who have agreed to speak on the first series are the Secretary of State Cordell Hull; the Under-Secretary of State Sumner Welles; Isaiah Bowman, President of Johns Hopkins University; David Sarnoff, President of the Radio Corporation of America; Waldemar B. Kaempffert, Science Editor of the *New York Times;* John Foster Dulles, Chairman of the Commission to Study the Bases of a Just and Durable Peace on Behalf of the Federal Council of Churches; Senator Elbert D. Thomas, of Utah, Chairman of the Committee on Military Affairs; Senator Robert A. Taft, of Ohio, member of many important committees; Senator Warren R. Austin, of Vermont, member of the Senate Judiciary Committee; Rear Admiral Harry E. Yarnell, formerly Chief of Naval Operations; Elmer Davis, Director of the



OWEN ROBERTS



SUMNER WELLES





WARREN AUSTIN





DAVID SARNOFF



HARRY E. YARNELL

MATTHEW WOLL



O.W.I.; Matthew Woll, Executive Vice President, American Federation of Labor; James Carey, Secretary-General, Congress of Industrial Organizations; Eric Johnston, President of the United States Chamber of Commerce; James Lawrence Fly, Chairman of the Federal Communications Commission; Mr. Justice Owen Roberts of the United States Supreme Court; Nelson A. Rockefeller, Coordinator of Inter-American Affairs, and many others.

Topics of discussion cover a wide range, illustrated by the following titles: "Underwriting Victory," "Science and the Future," "Building the New World," "Making the World Secure," "Alternatives for War," "Food and Health in the Future," "The Role of Labor in the New World," "Peace through World Trade," "The Problems of Communication," "Education for Freedom," "The New Frontiers of Justice," "The Role of the Americas," and more particularly "The Role of the United States in the Post-War World."

The general subject of the second series is indicated by such topics as: "Business Plans for the Future," "The Promise of Tomorrow," "Labor's Part in War and Peace," "Farms, Food and Plenty," "Moving America's Goods," "Paying for Victory," "Housing America," "Public Works and National Welfare," "Distributing America's Goods," "Economic Security for All," and "Guarding the Nation's Health."

Among the distinguished speakers being invited to participate in these programs may be mentioned: Senator Walter F. George of Georgia, Chairman of the Post War Plans Committee; Charles F. Kettering, General Manager of Research Laboratories of General Motors Corporation; Paul G. Hoffman, President of the Studebaker Corporation; Secretary of the Interior Harold L. Ickes; Assistant Secretary of State Adolph A. Berle; William Green, President of the American Federation of Labor; Philip Murray, President of Congress of Industrial Organizations; Wendell L. Willkie; Claude R. Wickard, Secretary of Agriculture; Herbert Hoover, ex-President of the United States; Juan T. Trippe, President of the Pan American Airways; George N. Shuster, President of Hunter College; Leroy A. Lincoln, President of the Metropolitan Life Insurance Company; Robert Moses, Park Commissioner of the City of New York; Leon Henderson, former Director of O.P.A.; Beardsley Ruml, Chairman of the Federal Reserve Bank of New York; Surgeon-General Thomas Parran, and several eminent representatives of our Allies among the United Nations.

The organization primarily concerned with the first series is the Commission to Study the Organization of Peace, which has been at work for some three years and has published important annual reports which have attracted wide attention in the press. This group has had the benefit of probably the ablest scholarly authorities that the country affords in the several fields which are primarily involved. Furtherfore, it has local group representation in several hundred centers throughout the United States. It is thus in a position to focalize thoughtful public opinion over a very wide geographical area.

James T. Shotwell, eminent historian and for many years the active head of the Carnegie Endowment for International Peace, is Chairman of the Commission. His intimate relations with our State Department over the years have afforded him unique opportunity to gain an appreciative understanding of our extraordinarily complex international problems. He has had extended experience abroad and has been in official contact with all the important organizations which have concerned themselves in the last few decades with the problems of peace. His presence at the head of the Commission affords the most convincing possible testimony to the absolutely objective and scholarly approach to the critical issues with which we are now confronted.

The Twentieth Century Fund, which has primary concern with the second series of programs dealing more explicitly with our domestic problems, is an institute for research in economic issues, having been established in 1919 and endowed by the late Edward A.

Filene. It is conducted by a board of distinguished trustees with an exceedingly able executive staff. It has made a specialty of important surveys affecting such matters as the tax problem, the national debt and government credit, the security markets, the budgeting of public health, labor and government, old-age security, the costs of distribution and the like. One has only to run down the list of names of the professional experts whom they have been able to employ to discover at once the outstanding character of the group. As a result, their findings have enjoyed from the first the widest recognition as authoritative and non-partisan. Mr. John H. Fahey is President of the Fund and Mr. Evans Clark, Executive Director.

It is perhaps too much to hope for complete success, but we are at least committed to making the effort to employ the new mass technique in radio in informing public opinion so that if possible we may as a nation avoid those negative and destructive consequences of World War I which came about through the hasty Post-War endeavors to enter into world commitments of which the public had been inadequately informed.

Needless to say, we shall not for a moment overlook the primary objective of winning the war, but we intend to do all that lies within us to make certain that this time we shall also win the peace. We are convinced that the chances for so winning the peace will be multiplied many-fold if we begin at once to give our best thought to the vast problems which we shall presently have to solve and to the characteristic features of that future world for which our citizens are now giving their lives and their fortunes.

Should we wait for this discussion until victory is won and the binding ties of a common cause are partially dissolved in resurgent self-interest, we may well lose again the opportunity to turn the blood and destruction of today into tomorrow's world of enduring peace, new freedom and opportunity.

The two series are designed as far as practicable to be analytical and essentially educational in approach. That they may be as constructive as possible the effort will be made to avoid mere political argumentation and debate. The positive opportunities offered by victory will be stressed rather than the merely unfruitful negatives. Nevertheless, every effort will be made to present as wide a variety of significant points of view as possible. No one specific answer to any after-the-war problem will be urged nor will the prepossessions of any pressure group, political or otherwise, be promoted. Propaganda in any ordinary sense will be entirely taboo. The only propaganda will be that connected with the insistence on the importance of having our people give thoughtful attention to the problems inevitably involved in the Post-War world. Not only shall we be attempting to achieve this result through the spoken word on the air, but we are also resorting to the printed word whereby the substance of the broadcasts may be preserved for readers as well as through the suggestion from time to time of stimulating and helpful bibliographies.

In conclusion, let me say that it is our firm purpose to make the broadcasts thoroughly practical and to avoid as far as possible merely vague generalizations. There will be opportunity for audience participation, not only through the concurrent discussion groups which will be brought together throughout the nation under the auspices of the cooperating organizations, but also through invitations to listeners to send in questions in advance with a view to having those which are obviously foremost in people's minds answered in the discussion periods on the air. We believe that these results will be greatly furthered by the cooperation of more than fifty nation-wide organizations that are participating in the creation of such listening and discussion groups. Outside the United States, the Canadian Association for Adult Education is arranging to make the series the study project of its discussion groups throughout Canada, numbering nearly 100,000 persons. A million leaflets are being distributed through all these groups and, as indicated above, each week's broadcast addresses are being published in leaflet form and distributed without charge to all who write for them.

As of the date of this writing 120 NBC stations are carrying the series, comprising so far as we are aware the largest radio network ever to broadcast any sustaining educational series.



RIC A. JOHNSTON

JAMES B. CAREY

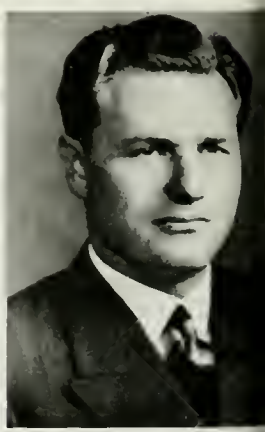


J. F. DULLES



JAMES L. FLY





NELSON A. ROCKEFELLE




PRESENTATION OF THE ARMY-NAVY "E" FLAG TO RCA LABORATORIES AT PRINCETON, N. J. LEFT TO RIGHT—OTTO S. SCHAIRER, ALBERT ROSE, MAJ. GEN. ROGER B. COLTON, USA, AND REAR ADMIRAL HAROLD G. BOWEN, USN.

# RCA Laboratories Win "E" Award

*PART PLAYED BY RCA SCIENTISTS IN DEVELOPMENT OF RADAR IS TOLD AT PRESENTATION OF ARMY-NAVY EMBLEM TO PRINCETON GROUP—EMPLOYEES RECEIVE "E" LAPEL PINS*

RADAR—detecting and ranging by radio—has changed the whole course of history, Rear Admiral Harold G. Bowen said June 17 at the presentation of the Army-Navy "E" Flag to RCA Laboratories, Princeton, N. J. The Battle of England was won, he said, because the British had radar to prevent the Germans from surprising the British planes on the ground, and he added, "you can be assured that radar has played a highly significant role in our successful operations to date."

Admiral Bowen spoke on the "E" presentation program with Gov. Charles Edison of New Jersey; Lieut. Gen. James G. Harbord, (USA, Ret.), Chairman of the Board of Radio Corporation of America; Maj. Gen. Roger B. Colton, USA, and Otto S. Schairer, Vice President of Radio Corporation of America, in charge of RCA Laboratories. The program was broadcast by NBC.

Referring to the story of radar as "astounding," Admiral Bowen said that in the history of technology, no art has ever developed so rapidly and no art was ever prosecuted at the same time in all branches—namely, research, development and production, as was radar. No such complex art was ever brought to a state of usefulness so soon, he said, and this was largely due not only to the position of technology in the United States, but first to the threat of impending war, and later, the war itself.

Paying high tribute to American scientists and research workers, Admiral Bowen continued:

"Ever since the invention of radar, the Navy and the great electronic laboratories have been in constant and fruitful contact. Our associations with RCA in this respect have been of long duration and most satisfactory. Of the first two radar sets that were sent to sea in 1938, one was manufactured by RCA and the other by the Naval Research Laboratory. The great progress of radar in the Navy and its gradual acceptance as a new fundamental contribution to war, dates from that time. The first sets purchased by the Navy from a commercial concern were six in number and were supplied by RCA."

Speaking directly to the research workers, Admiral Bowen concluded:

"You who have been in the middle of things like I have, appreciate the enormous amount of technological development successfully completed before actual combat took place. You who participated in this effort made great contributions to



. GEN. ROGER B. COLTON PRESENTS ARMY-NAVY "E" LAPEL PINS
NG CEREMONY TO GROUP REPRESENTING EMPLOYEES. THEY ARE
HE MELORO, GEORGE W. PARRY, CHARLES THIEL, ANTHONY
MO, AND GEORGE W. LECK.



REAR ADMIRAL HAROLD G. BOWEN AND MAJ. GEN. ROGER B. COLTON RECEIVE FROM GEORGE W. LECK (AT THE MICROPHONE) SIGNED PLEDGES FROM EMPLOYEES OF RCA LABORATORIES TO CONTINUE THEIR HIGH PERFORMANCE IN THE WAR EFFORT.

win the war long before the war started. To you we are indebted for our present technological excellence. But not content with what you accomplished before the war, you are still contributing to the war with conspicuous success."

General Harbord, in opening the ceremonies, pointed out that the "E" award was being "given, not for the production of instruments of war, but for the production of ideas that make such instruments possible.

"This is a war in which, in the long run, ideas forged on the anvil of science and research are more penetrating than bullets, more powerful than high explosives. Both as a company and as individuals, we are proud that ideas born in RCA Laboratories have had penetration and power in contributing to the development of radio, radar and kindred fields, and to the success and safety of America's fighting forces—on land, on sea, and in the air."

Governor Edison, introduced by General Harbord, who presided at the ceremonies, congratulated RCA Laboratories on winning the "E" award for high accomplishment in the war effort. "By winning it," he said, "you have also bestowed honor upon this State."

Governor Edison said that RCA Laboratories have become a pride of New Jersey. He referred to the Laboratories as a "great Electron House—the gateway to a better world and a foundation of the future."

"The radio-electron tube has become the heart of all radio, and it is extending its usefulness far afield into industry and into the home," said Governor Edison. "The tiny electron has worked wonders in service to mankind and has established a great record in the war. It travels with the Fleet, with the Air Force, and with the Infantry, because this is a War of Science. On this historic occasion, we may look upon the "E" as a tribute to the electron and a tribute to the research men who have achieved excellence in putting the electron to work as one of the most powerful influences for the preservation of civilization."

Otto S. Schairer, Vice President in Charge of RCA Laboratories, assisted by Miss Mary Di Domenico and Albert Rose of the Laboratories staff, accepted the "E" flag from Admiral Bowen, "as an emblem of high accomplishment which will inspire us not only to continued but to greater efforts to win this war speedily.

"To that end, and to a victorious peace," said Mr. Schairer, "we pledge our utmost service to the Nation."

Major General Colton, as representative of the Under-Secretary of War, presented "E" lapel insignia to employees of RCA Laboratories. They were received by a representative group, Anthony Cuomo, Miss Sophie Meloro, George W. Parry, Charles Thiel, and George W. Leck. In making the presentation, Major General Colton read the following citation:

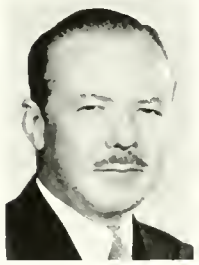
"For meritorious and distinguished service to their country in its time of need, the Army-Navy Production Award is presented to the men and women of the Laboratories of the Radio Corporation of America. By their unflagging spirit of patriotism, by their acceptance of high responsibility, by the skill, industry and devotion they are showing on the production front of the greatest war in history, they are making an enduring contribution not only to the preservation of the United States of America, but to the immortality of human freedom itself."

GOV. CHARLES EDISON OF NEW JERSEY, SPEAKING DURING THE CEREMONY, SAID THAT RCA LABORATORIES HAD "BESTOWED HONOR UPON THIS STATE."



# Commission to Harris

*BLUE NETWORK ENGAGES NOTED AMERICAN COMPOSER TO WRITE HIS SIXTH SYMPHONY—WORLD PREMIERE NEXT SPRING*



By Mark Woods

*President,*
*Blue Network Company*

IT ISN'T OFTEN that business takes time out to become a patron of the arts, because such radical departure from the long prescribed methods of commercial operation is not without a certain aspect of danger. For, with the arts belonging to the people, no staff of financial wizards, however invincible on home grounds, dares trespass on public domain without strong elements of reasonable doubt.

With this in mind, when the Blue Network commissioned Roy Harris, the noted American composer, to write his sixth symphony, we made no demands or even requests. It was reward enough when he assured us that the commission would enable him to compose a major choral symphony created around an American scene, and probably dedicated to the American service men.

Specifically, Harris will devote a full year to composing a work which will center around one of the many stirring events in the life of Abraham Lincoln—an event which will be as topical today, in this time of stress, as it was during Lincoln's presidency.

The world premiere will take place in the spring of 1944, with the new symphony played by the Boston Symphony Orchestra conducted by Dr. Serge Koussevitzky. It will be heard over the Blue Network, through whose facilities Harris' Fifth Symphony, first Fifth to be composed by an American, was heard both here and abroad on February 27 in its world premiere.

The case of a corporate body becoming a patron of the arts has its interesting points. While on the surface one might not anticipate such a procedure, a bit of thought on the subject should reveal the fact that when an industry owes its existence to the good will of the public, (and what industry doesn't?) it isn't too far fetched to hope that it might meet some of its obligations to the public in other ways than those with which the organization is primarily concerned.

There are the dividends which cannot be measured against the dollar sign—such as subsidizing of group insurance, hospitalization, old age pensions, housing developments for employees, and last but not at all least, the cultural and spiritual enjoyment encountered with the presentation of a comprehensive work of art.

History tells us that the subsidy of the arts is nothing new. For centuries the creators have been carried through their trying days by patrons gathered from the ranks of royalty and riches. And that brings to mind the strange apathy which the patrons have ever shown toward lending assistance to the composer, truly the step-child of the arts. Certainly Mozart, and Schubert, and Beethoven, were anything but favorites of the gods, all of them taking little more than their tattered clothes to the grave. Tschaikowsky and Wagner were more fortunate to some extent, both having had what we now might term "sugar daddies." And America's record is not better—consider Stephen Foster.

It remained for Dr. Koussevitzky to make a strong case for the composer on the day of the announcement that Harris was being commissioned by the Blue to write his sixth symphony. Dr. Koussevitzky, one of the greatest champions of all time for the cause of the living—living, mind you, not the dead—composer pointed out that when orchestras find themselves in hot water, they find themselves a financier, that once the musician survives his early martyrdom, he has easy sailing, and that the music goes round and round for the gain of all but lo, the poor serious composer. Without him the whole structure of music would dry up and blow away, yet he is permitted to shift for himself, to pine away in obscurity and, more to the point, insecurity.

Now, this is no brief for a grandiose plan to form a "feed the composer guild", but I am heartily in accord with Dr. Koussevitzky's theory that there should be some concrete interest in the practical ramifications of composing—permitting the composer to live. Lending an ear to the composer is all right as far as it goes, but it stops too far short of lending the pocketbook, or a reasonable facsimile thereof, toward the upkeep of said composer.

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SERGE KOUSSEVITSKY (STANDING, LEFT) AND MARK WOODS JOIN ROY HARRIS (SEATED) IN EXAMINING ONE OF THE NOTED AMERICAN COMPOSER'S SYMPHONIC SCORES.



# RCA WAR

EMPLOYEES OF RCA VICTOR DIVISION
"E" AND MARITIME COMMISSION AWA

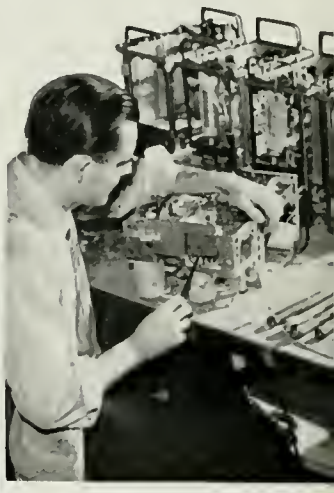


THIS BLIND MAN'S SKILLED FINGERS ARE CONTRIBUTING TO WAR PRODUCTION IN THE RCA VICTOR PLANT AT CAMDEN, N. J. ASSEMBLY WORK ON TRANSMITTER COILS (BELOW) IS PERFORMED BY GIRLS IN THE NEW YORK PLANT OF RADIOMARINE CORPORATION OF AMERICA.



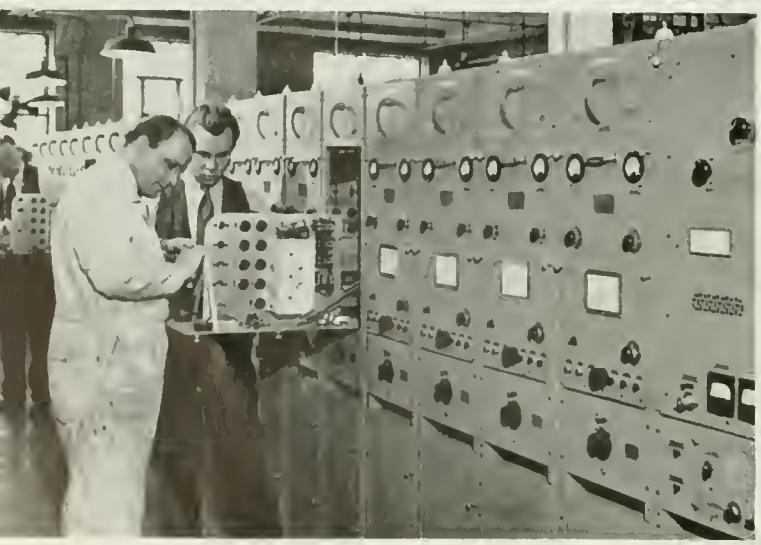
MANPOWER AND MACHINES COMBINE TO FASHION RADIO-ELECTRONIC EQUIPMENT FOR WAR AT RCA VICTOR'S CAMDEN PLANT.





COMMUNICATIONS EQU
RCA VICTOR'S CAMDEN
BOMBERS. TUBES THA
PURPOSES ARE STABILIZ
AT RCA VICTOR'S HARR





RADIO AUTOMATIC ALARMS AT RADIOMARINE ARE ADJUSTED BEFORE DELIVERY TO U. S. SHIPS.

THESE SMALL RADIO DIRECTION FINDER LOOPS ARE BEING COMPLETED BY RADIOMARINE FOR WAR SERVICE AT SEA.

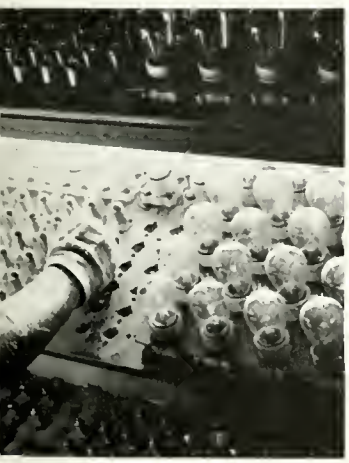


# PRODUCTION

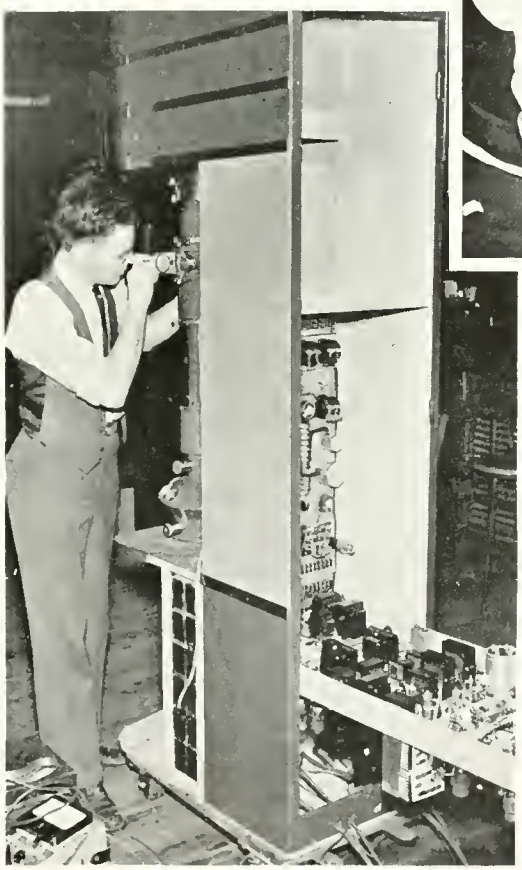
ADIOMARINE, WINNERS OF ARMY-NAVY
OGE CONTINUING OUTSTANDING EFFORT



ING TESTED (ABOVE) AT
STINED FOR LONG-RANGE
IANY RADIO-ELECTRONIC
"AGING RACK" (BELOW)
PLANT.



AS VITAL NEW TOOLS OF SCIENCE AT WAR, ELECTRON MICROSCOPES ARE ASSEMBLED (BELOW) BY RCA VICTOR FOR WAR PROJECTS ONLY.

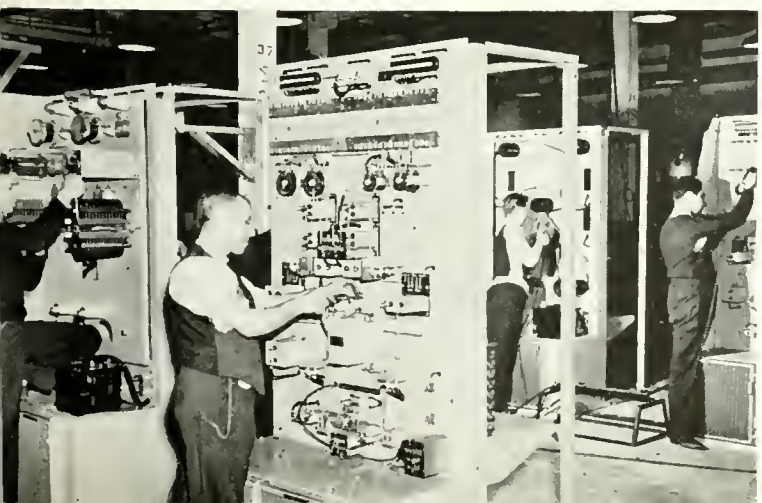


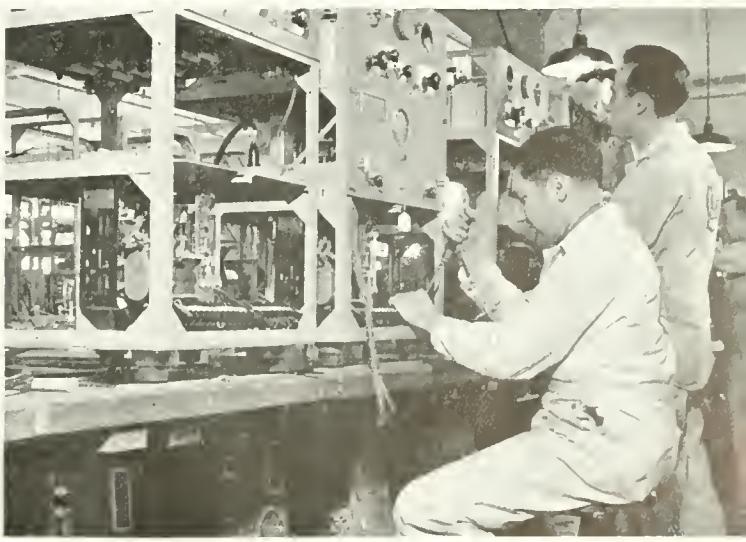


"SUBMERGED" WAS MARKED ON THIS BATTLE-DAMAGE
COMMUNICATIONS EQUIPMENT (ABOVE) SENT TO RC
VICTOR FOR RECLAMATION. SEALING TOGETHER PART
OF MINIATURE TUBES (BELOW) IS ONE OF MANY STE
IN MANUFACTURING AT RCA VICTOR IN HARRISON, N.



RADIO TRANSMITTERS IN THE RCA VICTOR PLANT AT CAMDEN, N. J., PASS ALONG THE FRONTLINE OF PRODUCTION.





RADIOTELEPHONE UNITS FOR SHIPS SERVING I
THE WAR EFFORT ARE PRODUCED BY RADIOMARINE



DURING HIS FIRST VISIT TO A RADIO COMMUNICATIONS MANUFACTURING PLANT IN CANADA, THE GOVERNOR GENERAL, THE EARL OF ATHLONE, (CENTER) STOPPED TO INSPECT THE WORK OF ONE OF THE EMPLOYEES IN RCA VICTOR COMPANY LIMITED'S MONTREAL FACTORY.

# With RCA–North of the Border

## *ORIGINAL DEVELOPMENT AND ENGINEERING OF RADIO EQUIPMENT FOR CANADA'S ARMED FORCES CONTRIBUTE TO WAR EFFORT—PRODUCTION FACILITIES IN MONTREAL EXPAND*

By A. Usher

*Advertising Manager,*
*RCA Victor Co. Limited,*
*Montreal, Canada.*

NORTH of the border, in the manufacturing section of Montreal, Canada's largest city, radio engineers, draughtsmen, laboratory assistants and office and factory workers in the modern plants of RCA Victor Company Limited, are working overtime—designing, developing and manufacturing radio communications equipment for the navies, armies and air forces of Canada and her sister nations in the British Commonwealth, and for other United Nations.

When Canada went to war, in September, 1939, it had already assembled a staff of technicians and radio communication experts that would give the young Dominion a strong right arm in the radio field. The complete story of its achievements may not be told until after the war is won—but already it makes a remarkable wartime chapter that will thrill future generations of Canada.

The wartime achievements of RCA Victor Company Limited, and the phenomenal growth of the Canadian company until it has become the most important radio engineering and manufacturing organization in the Dominion of Canada, really began in 1936, three years before Hitler launched World War II by marching into Poland. That year RCA Victor, manufacturer of phonographs, records and radio receivers for domestic use, concluded what is now known in the company as the pre-expansion era and began its remarkable career in radio engineering and production.

The new policy, developed at a time when few perceived the approaching war clouds and the danger to Canada and a free world of a Nazi-ridden Germany, was based on the important part that radio communications would play when those war clouds finally burst.

Immediate steps were taken to anticipate the needs of Canada, not only for radio equipment and the facilities to manufacture it, but also for the engineering skills, backed by imagination and vision in the radio communications field. It was a great ambition, but the company was determined that in this vital new field of modern warfare Canada would stand on its own feet and be self-sufficient. Consequently there began a period of company expansion, followed by recruiting of engineers and technicians, followed again by a general staff expansion and entry into serious production and development work in radio.



E. C. GRIMLY, HEAD OF RCA VICTOR COMPANY LTD., PINS THE MERIT AWARD DECORATION ON THE LAPEL OF MAJOR GENERAL LA FLECHE, MINISTER OF CANADA'S NATIONAL WAR SERVICES.

As war drew nearer, RCA Victor steadily increased its facilities, improved its techniques, until when war finally came, it occupied a leading place in Canadian radio. It had built and installed radio transmitters across Canada for the Canadian Broadcasting Corporation and important private stations. It had served the quickly-growing airways with special transmitters and cone of silence markers, 100 per cent designed in the company's engineering laboratories just before the war.

For four consecutive years, before devoting its facilities entirely to war production, it produced and sold more radio receivers than any other manufacturer in Canada. The company was steadily forging a fine reputation as a designer and maker of peacetime communications equipment.

In December, 1938, eight months before the war, the company established a new engineering department and set it to work in a small temporary building on the Montreal factory site. Meanwhile new modern quarters were being built. First job of this new department was to build two 50,000 watt transmitters for C.B.C.

During the summer of 1939—those last fateful months—a new, two-story building, glass-walled, fully-equipped with the latest in machines, laboratories and test equipment was completed and the engineering and manufacturing staff moved in. Then in 1940 additional space was needed to keep up with expansion of manufacturing facilities and a two-story, temporary type building was erected to accommodate shipping departments, space in the manufacturing buildings formerly occupied by these departments thus being made available for increased production. Growth continued, however, and with it the need for still more space. So, in 1941, a third building was constructed, a two-story wing connected to the one completed in 1939, which provided still greater facilities for the manufacture of war products. Finally, in 1942, it was decided that still another major addition would have to be made if RCA Victor was to carry the rapidly-increasing war load. Construction of another building, eliminating 30,000 square feet of obsolete space and replacing it with 100,000 square feet of new space, commenced in the summer of 1942. The new wing was completed in 1943. With this building occupied the company has approximately 335,000 square feet of manufacturing space, of which 315,000 is devoted solely to the production of war equipment.

When the Canadian Government reduced production of civilian radio equipment in October, 1941, the company had already changed its plant to an all-out war basis. This change-over was completed without interference with war production which was already under way and involved no shut-downs or delivery delays, even though it was necessary during this period to change techniques from mass production of domestic sets to mass production of highly technical war equipment.

Great as was the change in this radio organization during the last three years of the thirties, in the face of a threat of war, it has been even greater since hostilities commenced. Today the company has doubled the percentage of women it employs, and finds women workers as proficient as men in the type of work they are doing. It has withdrawn its staff of radio field salesmen and delegated to them the work of procurement, teaching them to serve as expeditors. The space formerly occupied by the wood-working cabinet factory is now used for war equipment and a small plant in nearby Verdun accommodates the wood-working section, which is also engaged in war work, making shell containers, mess tables, etc.

Figures may be cold, but those which may be published without betraying military secrets give a graphic picture of the progress made by this Canadian member of the RCA Family. Net sales during 1942, for instance, were three and a half times the 1936-37 average. For 1943 it is estimated they will be more than six times as large—practically all war production. The payroll has grown correspondingly. In 1936 there were 717 employees, in 1937 there were 747. By September, 1939, the total had grown to 875, a year later it was 1,198 and

IDEAS FOR IMPROVED PRODUCTION AND INCREASED EFFICIENCY COME FROM THIS GREATER WAR PRODUCTION COMMITTEE. SEEN HERE IN REGULAR SESSION.





CANADA'S WOMEN ARE PLAYING AN IMPORTANT PART IN WAR PRODUCTION. OF RCA VICTOR WORKERS IN MONTREAL, 46 PER CENT ARE WOMEN.

in 1941 the figure was 1,588. Last year 1,959 employees worked in the Canadian plant and the total for March of this year was 2,563. Since 1936 the staff has increased three and a half times.

Figures, however, do not begin to tell the story. New buildings, increased personnel, steadily increasing shipments of communication and sound equipment—all these are the exterior and visible signs of the company's progress since 1936. And all of these constitute an important company contribution to the winning of the war. But even more important, and increasingly so, are the contributions being made through the company's original development and engineering work which is far greater in quantity, and far higher in quality than the actual size of the company would indicate.

Engineering and designing sections of the company are staffed by approximately 70 engineers, draughtsmen, model makers and laboratory, assistants. With this engineering organization, admittedly the finest in the Canadian radio industry, the company is now completely equipped to handle all its own technical problems, initiating its own developments and pioneering in certain fields and is qualified, on the basis of accomplishment, to rank as a working partner in the RCA Family.

As a tribute to the progress and high professional respect enjoyed by RCA Victor, it is interesting to point out that the company has been retained as consultants not only to conduct technical surveys but also to engineer, design and develop communications systems and equipment.

Equipment designed, developed and manufactured by the engineering products division, for instance, is used by the Ferry Command, the Canadian Department of Transport, Trans-Canada Air Lines, the Royal Canadian Navy, the British Admiralty, the Royal Canadian Air Force, the Royal New Zealand Air Force, the Chinese Government, and other Allied forces, including those of the United States. Much of it is still on the secret list, some of it only partially so. And enough may be told to indicate the importance of the contributions this member company of the RCA Victor family is making to the United Nations' war effort.

A pre-war development, still in extensive use all over Canada, including the Yukon skyways between Edmonton and White Horse and along other Arctic air routes, is the system of airport traffic controls designed for Canadian civil airways. Of distinct Canadian design, these fan and cone-of-silence markers have saved many a plane in the north country. A 500 watt, low frequency transmitter, developed and manufactured by the company, is also used for communications along the northern route.

The company has, since the war, originated radio transmitter-receiver intercommunication equipment for trainer planes and an improved radio-transmitter-receiver for fighter aircraft. The latter equipment is designed for army co-operation, communication from fighter craft to its own base, from plane to ship or for tactical use in the air squadron with plane-to-plane communication. Faced with a specific problem of designing a high-powered set that would be useful at high altitudes, the company's engineers originated a high power transmitter for bomber aircraft with a wider frequency range, more power than previous sets and usable up to extremely high altitudes. This is believed to be the only high-powered set in the world that can be used at such altitudes. Six months' development work were needed to solve the altitude problem alone.

Known to United Nations forces on all fronts is the Canadian designed AT3, regarded as an outstanding ground and mobile transmitter. Designed originally by RCA Victor for the Royal Canadian Air Force it is also used by the Canadian army overseas, the Ferry Command, and various United Nations air forces, including the Chinese. This was RCA Victor in Canada's first big development job and with it the company won its spurs in the communications war.

After more than a year's development and experimental work the company produced a precision frequency measuring instrument for both air and ground use. Of advanced design, smaller and lighter than previous models, this compact set possesses accuracy equal to that of the best previous designs. When the United Nations began preparing to pass from the defense stage to attack, the company also designed a portable hailing equipment, useful for landing parties. Men wading ashore may carry a piece of equipment in each hand and maintain communications with their headquarters aboard ship.

Unusual and extremely efficient, too, is the "super switch-board" or multiple remote control and tone-keying equipment through which it

is possible to control up to 20 transmitters. Developed for the Royal Canadian Navy this set is used at shore stations and provides unification of big communications establishments.

The company's transmitter developments attracted interest outside the Canadian and British armed forces and as a result Camden entrusted to the Canadian company the designing of a 2 KW medium frequency telegraph transmitter to their specifications. The first sets manufactured from this design went to Africa for air transport use.

There are numerous other radio developments born in the modern engineering laboratories of RCA Victor in Canada. But the most spectacular of all, to date, is the 100 KW low frequency telegraph transmitter designed for the Royal Canadian Navy for long-distance, point-to-point transmission. This is a 100 per cent RCA Victor of Canada development; it is sensational in operation and has been adopted by the British Admiralty. Its post-war possibilities are unlimited. Its details are for the present at least, strictly secret.

RCA Victor in Canada also leads the Dominion in antenna design. Several engineers able to engineer any type of antenna for any frequency are on the development staff and they have designed, built and installed broadcast and high frequency directive antenna systems across the Dominion. Among their outstanding achievements is the development of an adapter—which bears the engineer's name—involving a method of greatly improving radiation efficiency of vehicle and tank antennas. This adapter, military authorities claim, almost doubles the output of present equipment. Tank commanders in Africa proved its value during the Libyan and Tunisian campaigns. In the antenna field, in addition to carrying on its own development and engineering work, the company does designing and developing for others in the Canadian radio industry.

Another important job was the revision of an English-design vehicle wireless set which, in its improved form, is now being used by the British and Canadian armies and also for lend-lease accounts in China and Russia. This equipment is being manufactured in large quantities by RCA Victor of Canada.

A number of new features were introduced when the Canadian designers took over the British set. The results of their labor are contained in a set which is easier to operate, gives better communication and has lower battery drain. The latter point is of particular importance. On the African desert, engineers pointed out, tanks used to go in hiding sometimes for as long as two weeks. They had to remain silent but be in constant touch with their headquarters and able to receive all messages. At the same time they were unable to run their motors to charge their batteries, and had to have sufficient juice in the batteries to start up when the orders came to move. Battery drain, therefore, was a matter of urgent importance and the new set, by overcoming this problem, helped in winning the Battle of Libya.

On another development engineers in this section spent two years improving tank set components, originating a new antenna and new base for antenna to swing, enabling it to take more punishment and at the same time doing away with the need for rubber. It is now hoped to do away entirely with rubber from the whole set. Other improvements engineered include increasing range without increasing battery consumption, a new armored fighting vehicle set which will do much more than previous equipment in less space. Both these contributions will add greatly to peacetime radio after the war.

All these engineering developments are important. Through them RCA Victor in Canada has contributed to the fighting strength of the United Nations. But behind the development program, behind the skilled engineering and design, there rests the great manufacturing facilities of this producing organization which is daily increasing its capacity and output. Radio communications equipment manufactured in this Montreal plant was used in the deserts of Africa; it has accompanied Commandos on their raids into Norway and it went with the Canadians to Dieppe. It has served, too, in the Pacific, with the forces of the Australians and New Zealanders and it is helping the Russians and the Chinese.

As important as its ability to design and improve is the company's capacity to produce. RCA Victor Company Limited has during four years of war justified all the efforts that went into its pre-war expansion.

Buy War Bonds

THIS BUILDING, WITH A TOTAL AREA OF 335,000 SQUARE FEET OF MANUFACTURING SPACE, IS THE PLANT OF THE RCA VICTOR COMPANY IN MONTREAL, CANADA. TO PERMIT GOOD LIGHTING, IT IS DESIGNED IN A "U" SHAPE.



# DAYTIME PROGRAMS CHANGE

*Blue Network, After Survey of Radio Listening Habits, Introduces Broadcast Innovations in Schedule —"Why" of Success is Outlined*



By Edgar Kobak

*Executive Vice President, Blue Network Company*

BLACK CATS and an umbrella opened in the house bring bad luck—and a daytime radio program which does not portray the everlasting agonies of a beautiful female is doomed to defeat.

"Nonsense," said the Blue Network, which refuses to believe in superstitions. "Three of a kind—all superstitions. Women do not turn pale with fear if they hear a variety or musical program while the sun is shining. Let's find out the truth."

It was in this mood that the Blue set out to conduct a survey of daytime listening habits which would give a complete picture of the daytime radio audience. Urging us on were the advertisers who wanted to take advantage of the lower time cost of the daytime hours but hesitated to compete with the dramatic serials, many of them seemingly as well-established as Rommel once appeared to be in North Africa.

With the brains of our program department teeming with new ideas for daytime programs, and several programs which had broken with tradition already on the air, we determined to get the housewife's opinions about what she hears during the daytime hours, the types of programs to which she listens and, incidentally, the effect of wartime activities on listening. Our questions were answered by 5,000 housewives in 77 cities, towns and farm communities.

Our findings dumped in the lap of the daytime serial heroine the most difficult problem of her career. Because we backed up our contention that a considerable proportion of the programs currently broadcast are wasted on deaf ears and that there is a demand for a new type of program. The result of the survey, in short, gave the "why" of the success of the Blue's innovations — to mention only two — "Breakfast at Sardi's," sponsored coast-to-coast by Kellogg and Minute-Man Soup, and Coca-Cola's "Morton Downey."

How did we arrive at these conclusions? Here are the facts. While 79 per cent of the total network commercial daytime hours are devoted to dramatic serials, only 50 per cent of the total listening time is devoted to this type of program. Only 53 per cent of housewives listen to daytime serials, and 36 per cent of all housewives and 28 per cent of those who do listen to the serials think there are too many on the air. The fact that one per cent think there are too few might be of interest to a psychiatrist.

In contrast, 20 per cent say there are too few serious music programs, 12 per cent say there are too few popular music programs, while only 10 per cent say there are too many of the latter.

That daytime listeners want new and varied types of entertainment can be seen in the discrepancy between daytime hours and total listening time devoted to serials, and the demand for a different type of program.

The findings on the most popular types of programs—81 per cent of radio families listen to news, 53 per cent to serials, 49 per cent to popular music, and 32 per cent to serious music—indicate that sponsors of daytime serials fail to reach the 36 per cent of women who use their sets daily but listen to other types of programs.



MORTON DOWNEY, SHOWN HERE IN HIS CHEF'S GARB, IS SCORING A SUCCESS IN ONE OF BLUE NETWORK'S NEW PRORGAMS.

In line with our consistently-stated belief that "the program's the thing" was the finding that nine out of ten radio families turn on their sets at some time during the day, for an average of 2.6 hours, but, contrary to general opinion, only 19 per cent of the women leave their sets tuned to one station and 51 per cent listen only to certain programs.

With regard to the effect of wartime activities on daytime radio habits, 26 per cent of the housewives say they are listening more to their radios during the daytime. Another interesting discovery is the fact that 7 per cent of the radio homes now have men engaged in night shifts who were not so employed a year ago, indicating that nighttime programs have lost 7 per cent of the male audience—now available at some time during the day.

Our survey did not attempt to prove that the Blue Network is the best advertising medium—in fact, we asked no questions about station or network likes and dislikes. We merely grew impatient with what we considered an unjustified taboo and chose the most forthright method of overthrowing it. The findings are available to all networks and agencies alike. We did, incidentally, bolster our reputation as an organization which is not afraid to think along new and untried paths in a business which too often bows to tradition.

# "SEWING" BY RADIO SHOWN

*New Electronic Machine Developed by RCA Laboratories for Use In Fabricating Plastic Materials Demonstrated to War Manufacturers*

AN electronic "sewing" machine that uses radio-frequency current instead of needle and thread to join plastic materials was demonstrated to war equipment manufacturers and members of the press for the first time June 2 at the Camden, N. J., plant of the RCA Victor Division of the Radio Corporation of America.

Although the new apparatus was primarily conceived as one of many post-war radio-electronic developments, the demonstration was held to show its possible applications to war equipment production. An experimental model was used, as developed by C. N. Hoyler and R. A. Bierwirth, under the direction of Dr. George H. Brown, research scientist of the RCA Laboratories at Princeton, N. J.

While the machine is still in the developmental stage and has not been placed in production, Fred W. Wentker, manager of the electronic apparatus division of RCA, pointed out that news of its development has already attracted considerable notice among many war manufacturers. Some of these war manufacturers are hopeful, he said, that the new device will help break bottlenecks in production where conventional processing methods have been found inadequate to meet urgent war needs.

Instead of needle and thread, the RCA Electronic "Sewing" Machine uses radio-frequency current; instead of ordinary woven cloth, it works on thermoplastics and thermoplastic coated fabrics—the new synthetic materials that are finding wide application in the making of raincoats and caps, weather balloons, and in the packaging of many types of food and oils, to mention only a few.

It "stitches" a thin solid seam that is air- and water-tight, creating a bond that is stronger than the material itself. It does this simply and easily, thus promising to overcome many fabrication difficulties involved in usual processing methods as applied to thermoplastics.

The radio sewing machine was created to meet a definite need in the sheet plastics industry. Thermoplastics, tough resilient material, can be rolled into large cloth-like sheets or can be used to form an air- and water-tight coating on standard fabrics. When cut into patterns, the sections are usually put together by sewing with thread, by cementing, or by fusing with externally applied heat. None of these methods has been found to be entirely satisfactory.



A TOBACCO POUCH MADE OF THERMOPLASTIC MATERIAL IS "STITCHED" TOGETHER IN A DEMONSTRATION OF RCA'S ELECTRONIC SEWING MACHINE.

Heat fusing has always appeared to be the most desirable method. The hot-iron methods which have been employed, however, have proved far from satisfactory for many applications because of the difficulty in maintaining uniform temperatures, because the materials stick to the heating plates, and because the materials tend to extrude when pressure is applied.

By generating heat inside the material itself and by using a minimum of pressure, RCA's electronic sewing machine eliminates these difficulties, according to Dr. Brown.

This is what happens. The material to be sealed, or "sewed," is fed across a table top through two small rollers which serve as the "needle." A small radio-frequency generator is connected to these rollers. As they pull the material along, they cause a concentrated beam of radio frequency current to pass through the material. Heat is generated by a dielectric loss, or, in other words, by the struggle of the current to get through the closely packed molecules of matter which compose the material. The heat, together with a very light pressure, causes thermoplastics to fuse, or weld, in a tight bond.



RADIO-FREQUENCY CURRENT TAKES THE PLACE OF NEEDLE AND THREAD IN THE ELECTRONIC SEWING MACHINE (LEFT) AS DEMONSTRATED BY RCA LABORATORIES.

THIS DEVELOPMENTAL MODEL (BELOW) OF THE ELECTRONIC MACHINE, WHICH IS BEING GIVEN NUMEROUS PRACTICAL TESTS, LOOKS LIKE CONVENTIONAL TYPE.



Somewhat similar in appearance and operation to the conventional sewing machine, the electronic device derives its heating current from a low-power oscillator. A small electric motor with foot pedal control drives the rollers. Ordinary alternating current of 110 volts supplies the power for both the motor and the oscillator.

Laboratory tests, according to Dr. Brown, have revealed the electronic machine as an effective instrument for the handling of such thermoplastics as vinylite, koroseal, and pliofilm. All three of these materials are being used in a widening field of practical applications.

Other methods of applying the same general principle to the problems of fabricating thermoplastics are under development in RCA Laboratories. It is possible, for instance, to use specially arranged electrodes in presses to seal the seams of a garment, or other product, in a single quick operation.

Development of the electronic sewing machine is another advance in a new field, which RCA scientists call "radiothermics." Heat generated by radio-frequency currents can be used in case hardening, annealing, welding, riveting, gluing, laminating, and in drying of wood, paper, textiles and other materials.

# RCA LIFEBOAT SETS SAVE 84

*Crew from SS Stag Hound, Using Combination Radio Telegraph-Telephone Units After Ship Is Torpedoed in South Atlantic, Is Rescued*

RADIO'S vital war-time role of saving life at sea is sharply emphasized in the story of 84 men who recently returned to New York after their ship, the *SS Stag Hound* of the United States Lines, was torpedoed and sunk off the coast of South America.

Adrift several hundred miles at sea in two lifeboats, which lost sight of each other, the *Stag Hound* crew maintained voice communication by radiotelephone, and contacted four potential rescue vessels in the two days that elapsed before they were picked up.

Both the *Stag Hound's* Captain, Harold H. McCaw, and radio operator, Edward F. Wall, credited the lifeboat's special radio equipment —a combination radiotelegraph-telephone unit, powered by hand-cranked generator—with effecting their rescue.

The story was revealed in a letter G. F. Ravenel, Vice President of the United States Lines, owners of the *Stag Hound*, wrote to Charles J. Pannill, President of the Radiomarine Corporation of America which built and installed the lifeboat radio apparatus.

"I think you will be interested in knowing that the Captain and the entire crew of one ship that was torpedoed arrived in New York today," said Mr. Ravenel. "The Captain reports that the radio sets performed perfectly. They were able to establish telephone communication between two lifeboats which were so far separated that they were out of sight even in the daytime. They contacted by use of Morse code four ships, giving their position. These ships decided amongst themselves which one was nearest and which should effect the rescue. This was accomplished two days later, but in the meanwhile the lifeboats were able to give their exact position every four hours.

"On the whole, the performance could not have been better, and it is Captain McCaw's opinion that these radio sets may very well have been the means of saving the lives of all men in both lifeboats. We desire to thank you for this contribution to the saving of life at sea during these times."

Wall, the radio operator, who served in the Navy on a destroyer in World War I, also was high in his commendation of the lifeboat radio equipment. He added:

"Too much praise cannot be given the simplicity and efficiency of the type set we had in the two lifeboats. The beauty of these sets is that they can be worked by telephone or telegraph so that in case the operator is missing or injured anyone in the lifeboat can work the set. Another feature—no batteries have to be bothered with, and naturally the set could be used day after day without its source of power being reduced."

## Guy Addresses Engineers

Frequency modulation, used in combination with the ultra high frequencies, provides so many points of superiority over amplitude modulation on medium frequencies, for many public and private radio services, that its use will be rapidly extended after the war, Raymond F. Guy, NBC Radio Facilities Engineer, told the combined conference of the Institute of Radio Engineers and the American Institute of Electrical Engineers, meeting recently in Cleveland. Guy's paper was titled "FM versus AM on the Ultra High Frequencies."



RADIOMARINE EMPLOYEES SIMULATE EMERGENCY CONDITIONS IN DEMONSTRATING LIFEBOAT SET, A COMBINATION RADIO TELEGRAPH-TELEPHONE UNIT.

# RCA DEVELOPS STETHOSCOPE

*Highly Sensitive Instrument Introduces Many Sounds of the Human Body Doctors Have Never Been Able to Hear — Clarity and Range Increased*

A NEW acoustic stethoscope has been developed in RCA Laboratories so sensitive in its range of hearing that it introduces many sounds doctors have never heard.

In much the same way that the RCA Electron Microscope is opening unseen worlds in the submicroscopic realm, this stethoscope, developed by Dr. Harry F. Olson, promises to widen the study of sound within the human body. The beat of the heart, normal or abnormal, respiratory rattles, peristaltic squeaks, murmurs and groans, all are amplified to facilitate diagnosis, based upon the structure of sound.

It has been found that the sounds of the body range from 40 to 4,000 cycles, the full range of which are covered for the first time by the new stethoscope. Above 4,000 cycles most of the sounds in the body are so weak that they are masked by the ambient random noises generated within the body. It is explained that respiratory sounds such as wheezes and the rushing of air are of a complex nature. Therefore, in designing the new stethoscope to gain maximum intelligence the instrument transmits all frequencies over the range from 40 to 4,000 cycles without attenuation or discrimination. The ordinary stethoscope has an effective range between 200 and 1,500 cycles.

The advantages of the new stethoscope, according to Dr. Olson, come from the fact that it couples the ears of the diagnostician much more closely to the human body through the employment of a reversed taper tube which results in greatly improved matching of the acoustic elements. Thus, sounds produced by the organs of the body are heard more clearly and their range is greatly widened.

In fact, so many new sounds are heard with the instrument, Dr. Olson said, that a filter is built into it to enable the user, by simply turning a knob, to limit the range at will. This was done at the suggestion of one of the testing physicians in order to prevent confusion until the meaning of the new sounds can be determined through further study. It also makes the stethoscope a more flexible tool of the doctor.

In discussing the practical application of the acoustic stethoscope, Dr. Olson pointed out that the conventional type of instrument is not effective with the lower sound frequencies of the heart or with the higher frequencies produced in the chest. The new stethoscope is expected to be invaluable by making these frequencies available to the physician.

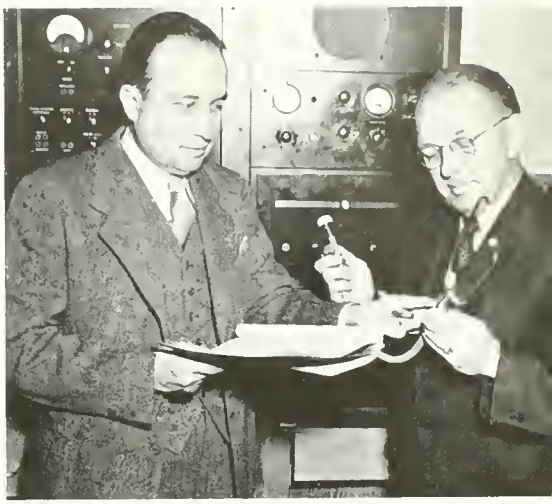
"By the application of modern acoustic principles, the new stethoscope has been developed in which the disadvantages of existing stethoscopes have been eliminated," said Dr. Olson. "As a result, the performance of the new stethoscope is far superior to existing instruments."

Detection of weak sounds by means of an ordinary stethoscope is limited, according to Dr. Olson, by the presence of noise which blankets the desired sound. "For the most part," he said, "such extraneous sounds are caused by the movement of clothing, and room noises, most of which are air-borne. The new stethoscope is insensitive to air-borne noise because of the high mismatch between the air and the stethoscope."

"The ordinary acoustic stethoscope," Dr. Olson continued, "is one of the most useful instruments which the physician uses in mediate auscultation (study of body sounds by the stethoscope). By means of the stethoscope the physician is able to study sounds produced within the heart, lungs, stomach, intestines, or other portions of the body, and to determine whether normal or abnormal conditions exist as indicated by sounds. Obviously, it is the structure of the sound, which involves the intensity, the fundamental frequency, and the harmonic components, that makes it possible to diagnose normal or abnormal conditions by auscultation."

The stethoscope was invented in the early years of the Nineteenth Century by a French physician, R. T. H. Laennec. Until now, there has been very little advance in its basic design.

Dr. Olson has been in charge of RCA's acoustics research as related to radio, sound motion pictures, and phonograph sound pickup and reproduction for many years. He is recognized as one of the country's leading authorities on acoustics.



DR. HARRY F. OLSON, LEFT, EXPLAINS TO H. D. BENSON, LABORATORY TECHNICIAN, THE PRINCIPLES OF THE NEW ACOUSTIC STETHOSCOPE.



DR. A. D. SUMMERS, COMPANY PHYSICIAN, WITH THE AID OF A NURSE, TESTS THE NEW STETHOSCOPE ON ONE OF THE RCA LABORATORIES EMPLOYEES.



DAVID SARNOFF, PRESIDENT OF THE RADIO CORPORATION OF AMERICA, ADDRESSES SEVERAL HUNDRED PERSONS AT THE ANNUAL MEETING OF STOCKHOLDERS.

# NEW ROLE SEEN FOR RADIO

*Sarnoff, Speaking at Stockholders' Meeting, Says Radio Will Electronize the Industries of Peace as It Has Instruments and Industries of War*

ENVISAGING outstanding opportunities for American enterprise in the postwar period, David Sarnoff, President of Radio Corporation of America, addressing the annual meeting of stockholders on May 4, said that radio will electronize the industries of peace as it has electronized instruments and industries of war.

Research and invention coupled with lessons learned in the war, and the accumulated demand caused by obsolescence, all will be released to re-cast radio for its new role in a world, which Mr. Sarnoff described as having been made smaller by aviation and by radio itself.

"Radio is not primarily an instrument of war," said Mr. Sarnoff. "It is above all things an indispensable implement of peace and culture. In our Country it is a servant of the people, regardless of geography, of age, or creed, or color. In the interest of the Nation and its welfare, we must not lose sight of the part radio will play in the future. Although we must first serve the present—lest there be no future—it is our duty to look beyond the horizon of war to survey our task in helping radio to meet its postwar responsibilities.

"With peace will come new industrial opportunities and world-markets, new services and greater efficiency enhanced by wartime lessons in conservation. These opportunities will bring problems that will call for clear thinking not only nationally but on an international scale as well.

"Radio is the one agency of mass communication which can bring all people everywhere within earshot of the great problems of peace and of the social and economic solutions that will be proposed. The war has proved the effectiveness of international short-wave broadcasting. Radio has won distinction as 'the Voice of the Freedoms.' It can be the world-wide voice of peace for whatever agency the victorious United Nations may agree to set up to preserve the peace of the world. The promotion of peace and good will, the reconstruction of the world, and the competition for new markets will require still greater expansion in this field."

While war has brought terrific energy to many fields of discovery and development, Mr. Sarnoff said that none has felt the impact more than radio. Predicting that radio instruments will emerge from the war almost human in their capabilities, he said that they would possess not only a sense of direction, but a sense of detection that will open new avenues of service. For example, the radio direction finder, which heretofore had only an ear, now also has an eye.

"The safety of aviation will be greatly enhanced, for the aviator will be able to see the ground through clouds or darkness," continued Mr. Sarnoff. "By the scientific application of the radio echo, the radio 'eye' will avert collisions, while the radio altimeter will measure the altitude and warn of mountains ahead or structures below.

"American inventive genius contributed much to the creation and perfection of the great offensive and defensive weapon, known in the United States as radar. The word means radio detecting and ranging. I am happy to report that RCA Laboratories have been in the forefront of radar research and development. The radio-electron tube was the key to its application. To prevent information from reaching the enemy which might facilitate their development of radar, news concerning it was restricted in the United States until recently. I believe it now can be said that by the use of radio and especially radar, the United Nations have been able to avert many disasters, save precious lives, and inflict severe damage upon their enemies.

"Television and radar add new dimensions to radio; wireless telegraphy was its first dimension, and broadcasting its second. Application of these new developments of radio to peace, opens new fields of service on land, at sea, and in the air."

The challenge to radio, however, does not all come from science, Mr. Sarnoff said, for radio has vast social as well as scientific and economic implications. For instance, electrons operate in response to the changeless laws of nature. But the performance of radio is regulated by the laws and actions of men—political laws which are subject to change.

"Freedom of the air, whether in broadcasting or television, ranks in importance and responsibility with freedom of the press," said Mr. Sarnoff, "and freedom of enterprise, in the case of radio joined




THE AMERICAN FLAG, FLANKED BY PENNANTS SYMBOLIC OF RCA'S OUTSTANDING WAR EFFORT, MADE A COLORFUL BACKDROP FOR THE STOCKHOLDERS MEETING.

with proper governmental regulation, is the surest guarantee of the greatest possible service to the people. From such free enterprise has come America's cultivation of science which is proving to be its salvation in the war. America's men of science have thrown up ramparts around Victory, and have provided armor for the preservation of liberty. They have made this country the most powerful industrial nation in the world, competent to be the arsenal of Democracy.

"When the full story of wartime radio is told, RCA, I believe, will be the symbol of 'first in war' in all phases of radio—research and invention, engineering and development, manufacturing and communication," said Mr. Sarnoff. "Our job ahead is to maintain RCA and radio 'first in peace.' With this our aim, we have a Post-War Planning Committee preparing for all phases of radio development. From scientific research to industrial results, we shall do our utmost to help win the war, to serve the peace, and to help in shaping a better world."

# STATIONS BUILT FOR ALLIES

*RCA Victor Designs and Installs Two 50,000-Watt Broadcast Units for Belgians and Fighting French on the West Coast of Africa*

FROM bases on the West Coast of Africa, American-made radio is helping to launch a new offensive against the Axis, with two new stations spearheading the propaganda attack, according to information just received by the International Department of the RCA Victor Division of Radio Corporation of America, which supplied and is installing the stations.

The Radio Station of the Belgian Government, speaking through its powerful new 50,000-watt RCA transmitter, is now on the air daily from Leopoldville in the heart of Belgium's African empire. Its broadcasts are beamed primarily at Belgium, and it has set as its first task the bringing of the true picture of the progress of the war to Belgians under the Axis heel and, in other important ways, aiding the cause of the United Nations.

Across the Congo River from Leopoldville, in Brazzaville, French Equatorial Africa, the antennas of another RCA transmitter are rising.

"The Voice of Free France," a 50,000-watt radio station that will carry Fighting French news to France and all parts of French colonial possessions from French Equatorial Africa, is now nearing completion and will soon join the United Nations network in its propaganda war against the Axis, it was revealed by RCA Victor.

The "Radiodiffusion Nationale Belge" and "La Voix de la France Libre" will speak to their own peoples in their own tongues and penetrate all corners of their homelands and their overseas domains with news, music, drama, and inspiration. Its mission was expressed by the Belgian station on its inaugural program when it declared:

"Our broadcasts are bombing missions. Our radio bombs carry the truth and this is explosive, too."

At a recent dinner, representatives of the Fighting French Government and the Belgian Government expressed to executives of the RCA International Department, service staffs and engineers, their appreciation of the manner in which the African assignments were handled. Close collaboration between Belgian and Fighting French representatives and the Radio Corporation of America was sustained on these assignments from the beginning.

Although details of the project and the problems and difficulties encountered in assembling, transporting and erecting the RCA transmitter cannot be revealed, the accomplishments are significant of this collaboration. The equipment of the Leopoldville transmitter was first to arrive. One month after it had reached the Congo port, the staff of the Leopoldville station, assisted by an RCA installation engineer, had the transmitter in operation—in just half the time normally required.

The new west African stations represent a new stage in the war of radio. They are ultra modern in every detail of their equipment. Tropical temperature and humidity, two of radio's natural enemies, are counter-attacked by a suitable choice of insulating and impregnation materials and air-conditioning, RCA revealed. Both stations are equipped for RCA Radiophoto service.

These two additions to what might be called the United Nations network will strongly support the stations in England, the United States and South America already reaching the seething underground forces in Axis occupied countries. They have further assignments in the war of communications.

# RCA CADETTES LEARN ABOUT RADIO

*Girls Selected From All Parts of Country by RCA Victor Division Receive Special Courses of Training as Engineering Assistants at Purdue University in Indiana*

INTRICACIES OF A LARGE POWER PRESS ARE EXPLAINED BY SHOP INSTRUCTOR TO PATRICIA VAN HOOS AND DOROTHY O'DEA, RCA ENGINEERING CADETTES.

WANDA KEPNER WIELDS A SOLDERING IRON AS SHE STUDIES RADIO REPAIR UNDER THE GUIDANCE OF PURDUE LABORATORY INSTRUCTOR F. J. TREBBEY.







ALL OF THE GIRLS IN THIS GROUP (LEFT) RECEIVING INSTRUCTIONS ON TELEVISION TUBES ARE FROM THE HARRISON, N. J., PLANT OF RCA VICTOR. THESE THREE INDIANAPOLIS GIRLS (BELOW) ARE BEING TAUGHT WORKSHOP PRACTICES.



# FUTURE LINKED TO SCIENCE

*Achievements of Physical Science Must Not be Blamed for the Ills and Evils in the World, Sarnoff Says in University of Air Program*

RECOGNIZING that both physical and social science weave the pattern of our civilization, David Sarnoff, President of Radio Corporation of America, participating on the "For This We Fight" program of the NBC Inter-American University of the Air, June 12, directed his discussion on the role of physical science as an influence that shapes the future.

Emphasizing the fact that it is not only the rate at which science brings changes, but the rate at which man's mind accepts those changes that is extremely important, Mr. Sarnoff pointed out that achievements of physical science create new social problems which in turn call for new solutions by society. One of the reasons for the difficulties in which humanity finds itself today is that progress of social science has lagged behind physical science, he said. Therefore, physical science is not to be blamed for the ills and evils that have befallen the world.

"When science is guided by the true spirit of man, it triumphs," said Mr. Sarnoff. "When commandeered by the evil-doer, it fails because justice is not on that side. Those who brought war against the United Nations have applied science to destruction. They have attempted to make men behave as electrons. We use science to regiment electrons, but not to regiment the minds of men.

"Powerful as a weapon of war on the side of Justice, and priceless as an instrument of Peace, science shapes our destiny. On scattered battlefronts, on land, on sea, and in the air, science is enlisted in the drive to Victory. Behind the battlelines, in the research laboratories of America, scientists are forging new ideas in the white heat which war applies to invention. For every new idea, and every new instrument produced, there is but one test—what can it do to help win the war quickly? Today, the flame of science burns under one crucible—the crucible of Victory.

"When the day of that triumph dawns over the United Nations, out of the vanishing clouds of war will arch a rainbow of promise projected by science. It will blend from the darkness of the passing storm into the sunshine of a bright future achieved by those who have fought for justice, freedom and faith. Science is a hope of civilization."

While science is a powerful factor in the conduct of this war, science will be more powerful in winning the peace, Mr. Sarnoff declared, because wartime developments in electricity and electronics, physics and chemistry, metallurgy and medicine, will be converted into the triumphs of peace. The new instruments and synthetic materials developed for war are foreseen as invaluable aids in reconstruction and rehabilitation, and in strengthening international goodwill and understanding.

"While it is true that the perpetrators of this war have perverted science to diabolical use, it is also true that science is a powerful force in preventing the triumph of evil," Mr. Sarnoff continued. "Those who took up the sword in an attempt to live and conquer by it, erroneously believed that by diverting science to warfare they could wage hostilities successfully even on a global scale. They took radio and the airplane, both invented for peaceful pursuits, and sought to use these swift agencies of science to cover a vast battlefield in the hope of a quick victory. They believed that they had science as their ally on a world-wide front. But they have discovered that science is not the exclusive agent for the forces of Might. Science can fight on the side of Right, and be the ally of Justice.

"American research and ingenuity were challenged by nations which had adapted American inventions to war and destruction. But America which created them, harnessed them to Victory on a scale undreamed of by the enemy. In this war, America is now the center of war production. It is the radio-electronic center of the world. America will be equally quick to shift its wartime scientific achievements to help the world at peace.

"We have learned from the peacetime records of aviation that the airplane is more than a fuselage propelled through space. It is science on the wing. Science is the soul of the plane. Were it not for research and engineering, aircraft could not climb into the stratosphere to win Victory. Nor, without radio, could hundreds of bombers dive at targets in the darkness with split-second precision to destroy the malignant forces that would obliterate civilization and with it the progress of science itself. In our bombers, on board the convoy, in the submarines, on battleships, in tanks and afoot with the infantry, the products of science are on constant guard to protect our future.

"One of the master keys of science—the radio-electron tube—is helping to open the way to Victory," said Mr. Sarnoff. "Everywhere—whether in the South Pacific or over the Mediterranean, on the Atlantic-Pacific sea-lane or on the Russian front—this magic tube is on duty. It is an eternal light. . . . Electrons are no longer confined to wires. They are free to work in a vacuum. Their activity within radio tubes has an influence that extends across the boundless universe. In the conquest of space, science shapes our future."

## Sponsors NBC Symphony

Alfred P. Sloan, Jr., chairman of the General Motors Corporation, and Niles Trammell, president of the National Broadcasting Company, announced on July 1 that the NBC Symphony Orchestra's Sunday broadcasts under the batons of Arturo Toscanini, Leopold Stokowski and Frank Black will be sponsored on the full NBC network for a year by General Motors. First broadcast under the General Motors banner will be on Sunday, August 1, 5:00 to 6:00 p.m., EWT.

Since its formation six years ago, the NBC Symphony has been a sustaining public service feature.



TECHNICIAN RECORDS OPERATING DATA FROM THE COMMUNICATIONS UNIT BEING TESTED IN THIS RECENTLY DEVELOPED ALTITUDE CHAMBER.

# TESTING RADIO "7 Miles Up"

*Aircraft Radio and Electronic Equipment Seen in Operation in Simple Altitude Test Chamber Created by RCA Victor's Engineers*

A NEW amazingly simple altitude test chamber for aircraft radio and electronic equipment, in which engineers can now for the first time see the entire apparatus in operation under conditions duplicating the stratosphere seven miles up, has been developed by the RCA Victor Division of the Radio Corporation of America. This simple chamber, constructed of the transparent nose cone of a bomber, is helping to speed delivery of radio equipment to air services from the Company's Camden plant where two of these new chambers are now in operation.

Built of transparent Plexiglas, a plastic developed by the Rohm and Haas Company, the chamber is actually the unfinished nose of a famous American bombing plane. Because of the transparent construction, it makes possible the complete testing and inspection of any piece of radio apparatus by several engineers at one time and materially speeds test work. This new construction has eliminated the difficulties found with standard test chambers which are constructed of metal and permit vision only through small portholes.

Defects in design, which normally would remain hidden until actual high altitude flights could be made, are now spotted at a glance. An entire complement of test instruments and meters may be connected to the apparatus under test and plainly viewed by the project engineers. At seven and one-half miles up, many things can happen to aircraft radio and electronic equipment, since apparatus of this type incorporates many delicate mechanisms. Low temperatures and pressures bring about changes in these delicate mechanisms which may cause current leakage, disabling electrical discharges, known among engineers as "flashovers," and other failures which usually will not occur at normal altitudes.

This chamber is cone-shaped, about four feet high and five feet in diameter at its base. It is just less than one-inch thick and capable of withstanding tremendous shocks and pressures. Normally, before assembly on its bombing plane, holes are bored for the business ends of machine guns and heavier weapons. In RCA's adaptation into a stratosphere test chamber, the holes are omitted, thus enabling the engineers to make it air tight. An air tight seal is accomplished by fitting a heavy platform, arranged for mounting radio apparatus under test, with a ring of soft rubber. The test chamber cone is then lowered until its base rests on the rubber ring. As the air is withdrawn by a powerful suction pump, the atmospheric pressure on the outside of the chamber forces it down into the rubber ring and creates a perfect air seal.

## New Discoveries

NO one realizes better than the scientist that each of his new discoveries is but a small drop in the ocean of infinite knowledge. No one appreciates better than the scientist the unlimited grandeur and mystery of the Universal Plan.

The man who says, "I have faith only in what I can see and understand," is one who has put his mind in a straightjacket. Our knowledge of man, and of the forces within and above him, is infinitesimal compared with our ignorance. Man does not even understand himself, let alone the universe.

DAVID SARNOFF

*(In an NBC broadcast marking the 20th anniversary of the "National Radio Pulpit.")*

## OUTLOOK OF POST-WAR TELEVISION IS BRIGHT

*RCA Research Director Beal Tells Institute of Finance in New York of Great Potentialities*

TELEVISION, with its electronic eyes made sensitive to ordinary light, will emerge from the war strongly qualified to become a vast post-war industry giving employment to many people in various fields associated with the new art, Ralph R. Beal, Research Director of RCA Laboratories, said June 1 in discussing "Radio-Electronic Research" before the Institute of Finance at the New York Stock Exchange. The spectrum of tiny wavelengths, measured in centimeters, he said, is being opened by the development of new radio tubes bringing possibilities to radio greater in scope than all of its past.

Predicting unparalleled progress in other fields as well as in radio, Mr. Beal said the potentialities stimulate the imagination of research scientists to visions of new and unexpected horizons in the fields of physics, chemistry, metallurgy, biology and in many industries.

Commenting on the post-war prospects of television, Mr. Beal continued:

"We now have electronic television. As an added service in broadcasting it has potentialities which surpass those of other mass communications services of information, education and entertainment. With post-war television broadcasting stations connected into networks, events of the nation will pass in review on the picture screens of home television receivers. Larger and brighter pictures of greatly improved quality will be realized and research and development plus genius in design and production will bring the television receiver set within the range of the average pocketbook.

"Post-war television will use electronic camera tubes which will be improved more than one-hundredfold in sensitivity, and that is not the limit. This will make it possible to pick up scenes with ordinary amounts of illumination. Night events, theatre performances, opera and many other programs which utilize artificial lighting will come well within the range of camera tube sensitivity. The problems of heat and glare in television studios have been solved.

"And then we have theatre television with possibilities as a post-war service. For the first time in the centuries of theatre history, a means is available for bringing to theatre audiences the thrills and drama of events as they occur in real life. Electronic methods have made it possible to produce pictures of theatre-screen size. RCA Laboratories demonstrated a picture about twenty feet wide shortly before the outbreak of the war."

Envisaging automatic radio relay stations as the key to network television, Mr. Beal told how the television pictures would be flashed from city to city to home audiences. At the same time he depicted interconnecting circuits carrying television pictures of events directly from the scene of action to theatres in different cities.

## 3 IN RCA VICTOR WIN WPB MERIT AWARDS

*Two Men and Woman Given Honors for Suggestions That Speed War Production Effort*

TWO certificates of individual production merit and one honorable mention were awarded to RCA Victor Division employees in the War Production Board's list of honors announced by the Office of War Information on May 31.

The awards were:

CERTIFICATE OF INDIVIDUAL PRODUCTION MERIT

Charles Chudoba, machinist, RCA Victor Division of Radio Corporation of America War Production Committee, Harrison, New Jersey, suggested a way of preventing burnt out coils on induction heating equipment, which not only saves 350 pounds of copper but also 450 man hours per year. He proposed enclosing the coils in fibre glass sleeves, which prevents sweat, oxide and scales from short circuiting the turns of the coils. The sleeves have been in use for three months without a single burnout. Chudoba has been at RCA Harrison for 3 years.

CERTIFICATE OF INDIVIDUAL PRODUCTION MERIT

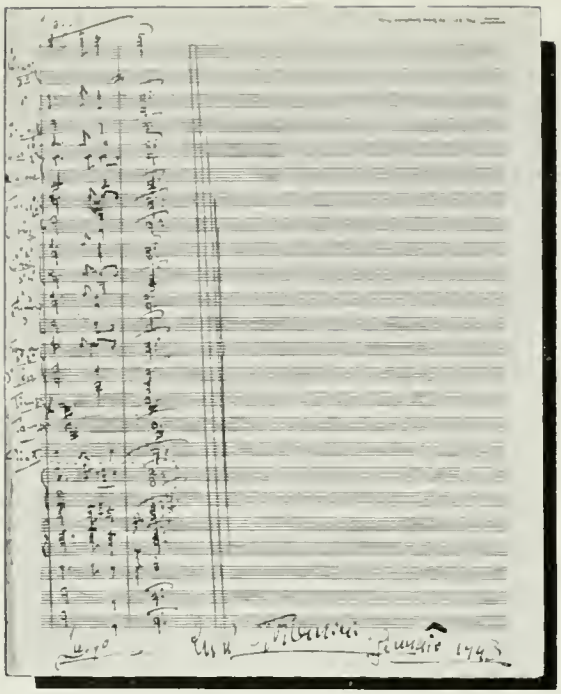
Gerald Thinnes, working group leader, RCA Victor Division of Radio Corporation of America—CIO Electrical Workers, War Production Drive Committee "To Beat the Promise," Camden, New Jersey, suggested a new process of lapping electrodes which has speeded up production and delivery of vital parts in communications manufacturing. Electrodes were formerly lapped by hand with a production cycle of two minutes per electrode. Thinnes suggested that twelve electrodes be put on plates similar to the method used for crystals; and that they then be lapped down to requirements. This method consumes ten minutes for twelve electrodes, or approximately 8/10ths of a minute per electrode. Thinnes, 23 years old, lives in Runnemede, New Jersey, and is a graduate of Audubon High School. His employment at RCA Victor began in September of 1939.

HONORABLE MENTION

Mrs. Ann Keefe Drewes, chief statistical clerk, RCA Victor Division of Radio Corporation of America Production Committee, Harrison, New Jersey, decided that the hectograph machine could be used on certain forms to eliminate both a three-day wait necessary for filling out by pen and ink and the cost of making photostatic copies. Mrs. Drewes has been employed at RCA Harrison for 3 years, starting as a clerk. She completed a course in Comptometry before gaining her present position. Her Production Committee says of her suggestion: "The idea shows clearly that the people who do clerical work can submit ideas which will aid our War Effort, in the same manner as that of a Production Worker."

## Wins Safety Trophy

The Camden plant of RCA Victor, on recommendation of the National Safety Council has been awarded the Liberty Bell for excellent safety record in 1942. The presentation was based on the plant's record of 22 per cent reduction of time lost through accidents.



AUTOGRAPHED SHEET FROM ARTURO TOSCANINI'S ARRANGEMENT OF THE "STAR SPANGLED BANNER," WHICH BROUGHT $1,000,000 IN WAR BONDS.

# PRAISE FROM MORGENTHAU

*Secretary of Treasury Thanks Toscanini and NBC Symphony Orchestra for Easter Concert that Raised $11,190,045 in War Bond Purchases*

DEAR MR. TOSCANINI:

You have my warmest thanks for Sunday's concert. You expressed in music the might and power and fierce resolve deep down within all of us to battle to victory—a resolve that is sometimes hard to express in words.

Please tell the NBC Symphony Orchestra for me that I wish I were able to thank each of them personally for the performance.

It is gratifying to know that admissions to the concert resulted in sales of Second War Loan Bonds totalling more than ten million dollars — money that will fight for the right of man to utter his beliefs and feelings openly and sincerely, whether in music or words.

Sincerely,

(Signed)

HENRY MORGENTHAU, JR.

Thus did Secretary of the Treasury Henry Morgenthau, Jr., thank Arturo Toscanini and the NBC Symphony Orchestra for the Easter Sunday War Bond concert, which netted Uncle Sam's fighting war chest $11,190,045 in bond purchases.

The concert took place in Carnegie Hall in New York and featured Vladimir Horowitz, noted concert pianist and son-in-law of Maestro Toscanini in an all-Tschaikovsky program. So great was the interest in the concert that $10,190,045 in bonds was purchased by ticket holders as admission to the hall. The audience literally "hung from the rafters". Many members of the press gave up their prerogative of press passes so that more seats in New York's largest concert hall would be available for the bond sale.

An additional sum of $1,000,000 was raised by auctioning the original manuscript of Toscanini's own arrangement of the "Star Spangled Banner". Robert St. John, NBC correspondent and commentator, asked for the bids over the air. The winning bid of $1,000,000 came from W. T. Grant of Kansas City.

This was one of many times that Toscanini has lifted his baton to flay the dictators. In the season 1941-42, he conducted the NBC Symphony in a series of five special bond concerts. And again this summer Toscanini uses his art in the cause of freedom.

Realizing that war recognizes no seasonal letup, Toscanini offered his services to the Treasury Department for four summer concerts. The broadcasts, scheduled for the regular Summer Symphony broadcast time, Sundays on June 20, July 18 and 25, and September 19, at 5 p.m. (EWT), take place before audiences composed entirely of service men and women. Maestro Toscanini extended invitations to nearby posts of the Army, Navy, Marines, Coast Guard and Maritime Service. The invitations were promptly accepted.

In addition to the official thanks of the Treasury Department for the Easter Concert, Toscanini and the orchestra received warm praise from music critics for the musical excellence of the program. Toscanini has always contended that great art can flourish best in an atmosphere of liberty and justice.

## Photophone In Australia

With the aid of portable RCA photophone equipment especially designed for this rugged job "down under," remote battle stations in Australia are enjoying sound pictures as part of the Army's entertainment-for-morale program. Mobile units travel thousands of miles under difficult conditions. Their performance has been hailed enthusiastically by the troops. RCA Photophone of Australia, subsidiary of RCA, supplied the equipment to the Australian military forces.

The "vans," as the Australians call them, were designed to operate at great distances from sources of replacements. They were built to bring the sound and projection equipment safely through rough country.

# NEW RADIO CIRCUIT OPENS

*Presidents Roosevelt and del Rio, Communications Leaders Exchange Greetings As RCAC Begins Telegraphic Service Between U. S., Ecuador*

AN EXCHANGE of messages by President Roosevelt of the United States and President del Rio of Ecuador on May 1 marked the opening by R.C.A. Communications, Inc., of the first direct radiotelegraph service between the two countries.

Several other messages transmitted in observance of the opening included exchanges of greetings by Senor Alberto Wright, Ecuador's Minister of Communications and Public Works, and James Lawrence Fly, Chairman of the Federal Communications Commission, Washington, D. C.; Lieut. Gen. James G. Harbord, Chairman of the Board, Radio Corporation of America; David Sarnoff, President of RCA, and William A. Winterbottom, Vice President and General Manager, R.C.A. Communications, Inc.

In reply to Senor Wright, who said that radiotelegraph service between the two countries "is a new link which no doubt will make even closer the bonds of friendship which unite the Ecuadorean and North American peoples," Mr. Sarnoff said:

"I fully share the sentiments expressed in your kind message that the new radiotelegraph circuit linking the sister Republics of Ecuador and the United States will bring our peoples even closer together in tightened bonds of friendship, and have full confidence that the improved and more economical communication service inaugurated today and made possible by the friendly cooperation of your Government will also further enhance the cultural and commercial relations between our two countries."

Said General Harbord, in reply to Senor Wright:

"In behalf of the officers and directors of the RCA organization, I wish to thank you for your kind felicitations upon the opening of direct radiotelegraph service between Ecuador and the United States and to express my gratification that through the miracle of modern radio, the voice of Ecuador may now be heard around the world."

The new service operates over a direct radio circuit between New York and Quito, capital of Ecuador. It was pointed out by Mr. Winterbottom that until now, a cable monopoly in Ecuador has prevented that country from engaging in radiotelegraph operations with other nations.

## Critics Select Symphony

The cause of the modern composer got a substantial boost on Sundays, May 30 and June 6, when the NBC Summer Symphony Orchestra, under the baton of Frank Black, cooperated with the Music Critics Circle of New York in the presentation of two broadcasts embracing five new works nominated by members of the circle for the designation of "best American orchestral composition of the 1942-1943 season."

This was the second annual quest conducted by the Critics Circle—an organization of music reviewers of New York newspapers and several magazines—for the topnotch new work of a season. The total playing time of the five nominations made it necessary to allot two full-hour broadcasts of the NBC Summer Symphony to the official "rehearing" of the works by the full roster of the Critics Circle. Olin Downes, critic of the *New York Times* and chairman of the Circle, spoke on the first broadcast.

The first program included Morton Gould's "Spirituals for String Choir and Orchestra," William Schuman's "Prayer — 1943" and Paul Creston's "Symphony No. 1." The second broadcast presented Aaron Copland's "A Lincoln Portrait" and Roy Harris's "Symphony No. 5." Winning composition, determined by the final balloting, was the Creston symphony.

# RCA TO SPONSOR RADIO SHOW "WHAT'S NEW?"

*Sarnoff Announces New Weekly Program Starting September 4 On Blue Network*

A NEW one-hour radio program headlined "What's New?" will be sponsored by the Radio Corporation of America, it was announced July 20 by David Sarnoff, President of RCA, who said that the contract has been signed with the Blue Network for the premiere on September 4 over 158 stations from Maine to Hawaii. The show will be broadcast on Saturdays from 7 to 8 P.M. EWT. Don Ameche, star of radio and screen, will be master of ceremonies.

The theme of the performance will be a weekly kaleidoscopic broadcast of "What's New" throughout the world—in news, science, sports, theatre, films, music, art, education, books, agriculture and the home. In fact, anything new and important will qualify for a place on this program designed to keep listeners up-to-the-minute on the world's latest developments in all activities.

Eye-witness and first-hand reports will be featured. New songs, new artists, new heroes, new wonders will qualify to give the program a fast pace. Timeliness will be the keynote of the sixty minutes, as radio skips from New York to Hollywood, and to other places at home and abroad where something new is to be microphoned.

"This program covering a broad scope and possessing a challenging theme will afford splendid opportunity from week to week to reveal radio as a new and modern art form at its best," said Mr. Sarnoff. "With variety in talent and always something new, the aim in showmanship will be to present a timely performance of interest to listeners of all ages. We will draw upon the latest in radio art technique and in science to make this a program of high quality entertainment for Americans in all walks of life."

## Buy War Bonds



# Towers that talk . . .

Tall towers of slender steel. A spider web of steel flung across the sky. A small building. Nothing more.

Nothing more?

Much, much more—for this is radio. And in radio as in man, the things unseen count most. Like the power of the human spirit, the energy of radio is invisible.

From the silence of these towers comes to Americans afloat and ashore—on ships and at naval bases—the ringing words of America's leaders, the lilt and lift of radio music, the saving grace of radio humor, the thrills of radio drama—inspiration, encouragement, the touch of home—the tonic interlude of entertainment in the grim grind of war.

This is the work of America's broadcasters, in which RCA is proud to assist. Through years to come radio broadcasting will render service now but dimly realized—not only in standard broadcast, but in short-wave, FM, television, and facsimile—in these, too, RCA's special knowledge, extensive facilities and tireless research will play their part.

RCA's resources are today concentrated on war production. And RCA equipment is at work on all the seven seas, maintaining dependable lines of communication between ship and shore—ship and ship—ship and plane. Helping to safe-guard our convoys—to coordinate our forces for defense and attack—to locate, strike and crush the enemy.




RCA

## RCA BROADCAST EQUIPMENT

RCA VICTOR DIVISION · RADIO CORPORATION OF AMERICA · CAMDEN, N. J.

# THE BLUE NETWORK SALUTES
# THE WOMEN'S NATIONAL RADIO COMMITTEE
# AND THE
# WINNERS OF ITS ANNUAL AWARDS



In the decade that it has been in existence, The Women's National Radio Committee (representing 25 national organizations with a membership of over 17,000,000 women) has made an important contribution to radio broadcasting. Through its Annual Awards—and its public recognition of outstanding radio programs—the Committee has been an influence in improving the standards of entertainment on the air.

This year again, for the ninth time, the Committee has announced its Awards winners. And this year, the awards are largely in recognition of the effectiveness with which the winners have served the nation's war effort.

The Blue Network is glad to pay public tribute to the Women's National Radio Committee; to the National Broadcasting Company and the Columbia Broadcasting System, each of whom carries one of the winning programs; to all the sponsors whose programs won awards; and to all the writers, actors, singers, musicians and technicians on the programs.

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**HERE IS THE FULL LIST:**

| PROGRAM | CLASSIFICATION | NETWORK | SPONSOR |
|---|---|---|---|
| Metropolitan Opera | Music | BLUE | The Texas Company |
| Cavalcade of America | Drama | NBC | DuPont Company |
| Let's Pretend | Young People's Programs | CBS | Sustaining |
| Raymond Gram Swing | News Analyst | BLUE | Socony-Vacuum Company |
| Town Meeting of The Air | Forum | BLUE | Sustaining |

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We of The BLUE would be less than human if we were not both glad and proud that three out of the five winners are Blue Network programs... In addition to the winners, we salute the following programs which won Honorable Mention:

*Music:* New York Philharmonic (CBS) and The Telephone Hour (NBC)
*Drama:* Lux Radio Theatre (CBS); This is Our Enemy (MBS); One Man's Family (NBC)
*News:* H. V. Kaltenborn (NBC) and Gabriel Heatter (MBS)
*Forum:* Chicago Round Table (NBC); Quiz Kids (BLUE); American Forum of The Air (MBS)
*Young People's Program:* Rainbow House (MBS) and The Aldrich Family (NBC)

*And these citations:* to station WQXR, New York, for "Music programs of unusual quality and interest"
and to station WMCA, New York, for "the program furthering democratic ideals and public service"

*The Blue Network*
A RADIO CORPORATION OF AMERICA SERVICE




***These, too, are fighting flags of freedom*** . . . In ever-increasing numbers, flags like these fly over America at war. They are symbols of the strength of a free people, aroused in spirit, united in purpose. Battle flags of Victory today . . . they are won by the energy and skill that will build a better world tomorrow.

**SERVICES OF RCA WHICH HAVE WON OUR COUNTRY'S HIGHEST WARTIME AWARDS**

***Army-Navy "E" flags awarded to:***

RCA Victor Division, Camden, N. J., January, 1942—with two stars for continued excellence.

RCA Victor Division, Harrison, N. J., August, 1942—with one star for continued excellence.

Radiomarine Corporation of America, New York City, September, 1942—with one star for continued excellence.

RCA Laboratories, Princeton, N. J., May, 1943.

***Maritime Commission "M" Pennant and Victory Fleet Flag awarded to:***

Radiomarine Corporation of America, New York City, February, 1943.

RCA

# Radio Corporation of America

# RADIO AGE

RESEARCH · MANUFACTURING · COMMUNICATIONS · BROADCASTING




RCA

OCTOBER

1943




# ....Radio Brings Them the Sidewalks of Home

Sure enough, that's a New York announcer giving the football scores! And there's no mistaking that hot music—it's a famous Chicago "name" band. And that comedian from Hollywood—why, he's the same zany who kept them in stitches every week back home.

American radio manufacturers have supplied sturdy little short-wave sets that bring America to any part of the globe. And that's been a big factor in the sky-high morale of our fighting men overseas.

Every day, U. S. radio manufacturers are making huge deliveries of military radio equipment to speed the day of victory. Their war experience, added to their manufacturing skill, is effecting technical advances that will be important to peacetime production.

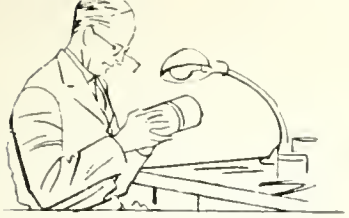
*Your purchase of War Bonds will help supply American fighting men with the world's finest equipment.*

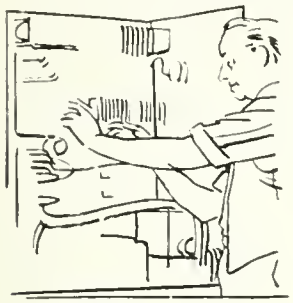


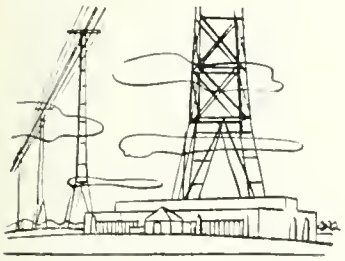
SCIENCE SMASHES AT THE AXIS in RCA Laboratories, working unceasingly in radio-electronic research. Proud of the privilege of serving America's great radio industry in its united war against the Axis, RCA will continue to make the fruits of its basic research available to American makers of radio equipment. This will help American manufacturers to provide finer radio-electronic products and services to a world at peace.

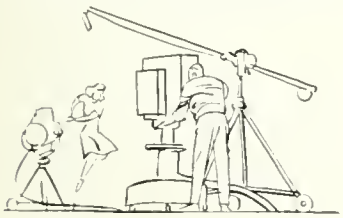
*RCA Laboratories*

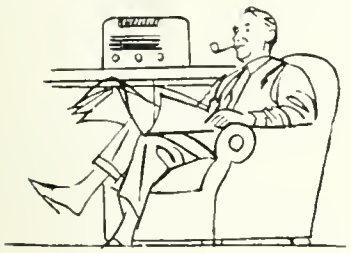
**A SERVICE OF RADIO CORPORATION OF AMERICA**











THE COVER—This color photograph of various phosphor applications was taken in a dark room with "black light," i.e. ultraviolet, to excite the phosphors. The large letters are cardboard coated with phosphors; the glass bottles and two series of glass vials contain phosphor crystals; the oscillograph panels are phosphor-coated by the silk screen process; the small RCA emblems are phosphors enamelled on iron plates, and the discs and knobs are transparent plastics containing embedded phosphor crystals. All of the phosphors shown are derivatives of zinc sulphide. (See story on page 7)


# RADIO AGE

RESEARCH · MANUFACTURING · COMMUNICATIONS · BROADCASTING

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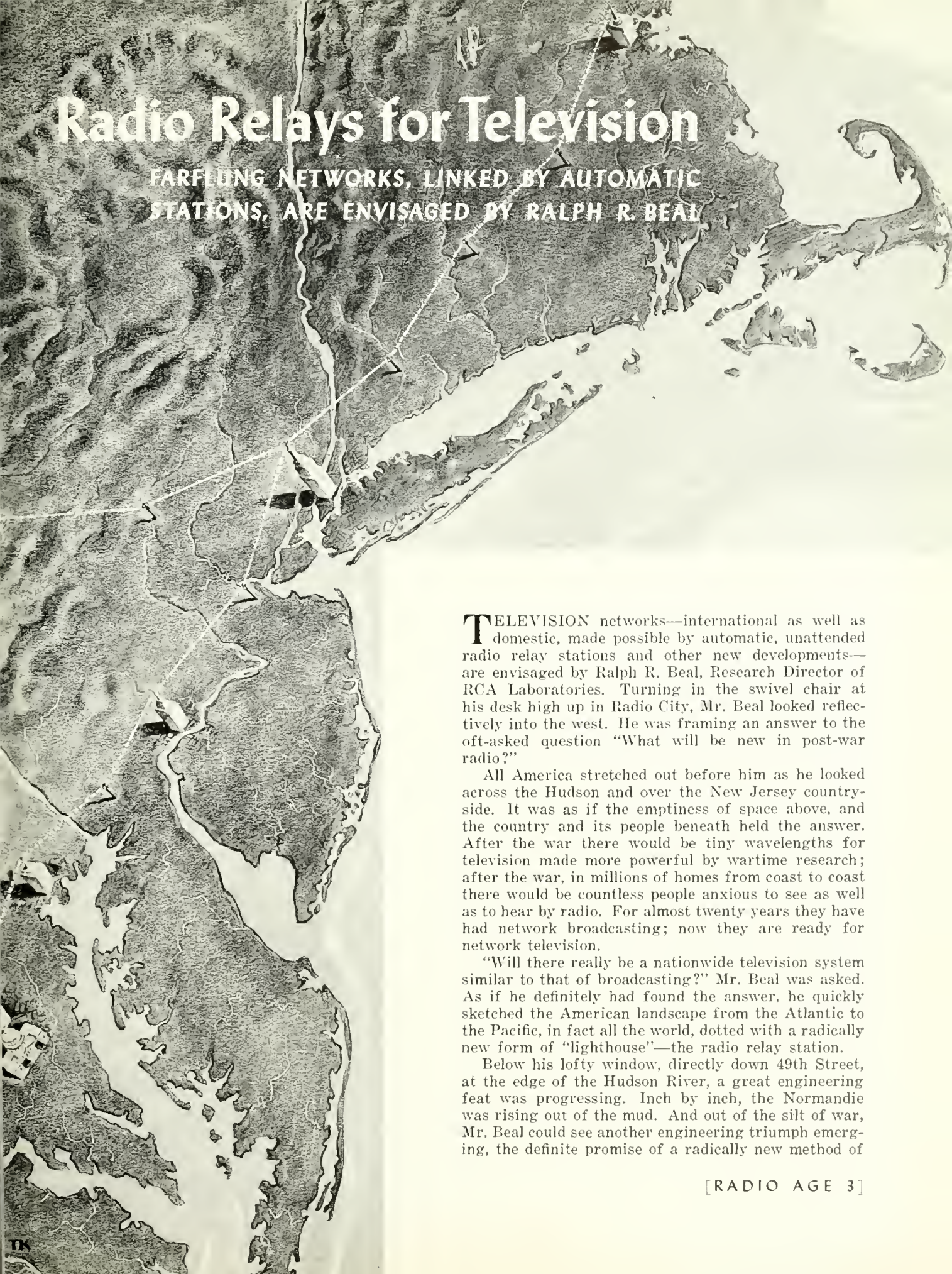


—NBC Photo by Sydney Desfor

*O say, can you see,*
*by the dawn's early light,*
*What so proudly we hailed*
*at the twilight's last gleaming?*
*Whose broad stripes and bright stars,*
*through the perilous fight,*
*O'er the ramparts we watched*
*were so gallantly streaming?*

---

THIS UNUSUAL SCENE, PHOTOGRAPHED AT DAWN SEPTEMBER 14, SHOWS LUCY MONROE (LEFT), RCA'S DIRECTOR OF PATRIOTIC MUSIC, SINGING THE STAR SPANGLED BANNER ON THE RAMPARTS OF OLD FORT MC HENRY, BALTIMORE, MD. HERE, ON THE SAME DATE 129 YEARS AGO, FRANCIS SCOTT KEY CONCEIVED OUR NATIONAL ANTHEM.



# Radio Relays for Television

## FARFLUNG NETWORKS, LINKED BY AUTOMATIC STATIONS, ARE ENVISAGED BY RALPH R. BEAL

TELEVISION networks—international as well as domestic, made possible by automatic, unattended radio relay stations and other new developments—are envisaged by Ralph R. Beal, Research Director of RCA Laboratories. Turning in the swivel chair at his desk high up in Radio City, Mr. Beal looked reflectively into the west. He was framing an answer to the oft-asked question "What will be new in post-war radio?"

All America stretched out before him as he looked across the Hudson and over the New Jersey countryside. It was as if the emptiness of space above, and the country and its people beneath held the answer. After the war there would be tiny wavelengths for television made more powerful by wartime research; after the war, in millions of homes from coast to coast there would be countless people anxious to see as well as to hear by radio. For almost twenty years they have had network broadcasting; now they are ready for network television.

"Will there really be a nationwide television system similar to that of broadcasting?" Mr. Beal was asked. As if he definitely had found the answer, he quickly sketched the American landscape from the Atlantic to the Pacific, in fact all the world, dotted with a radically new form of "lighthouse"—the radio relay station.

Below his lofty window, directly down 49th Street, at the edge of the Hudson River, a great engineering feat was progressing. Inch by inch, the Normandie was rising out of the mud. And out of the silt of war, Mr. Beal could see another engineering triumph emerging, the definite promise of a radically new method of



communication—the automatic relay of television pictures and messages from city to city, from country to country. Just as surely as the Normandie was rising, so was the dawn breaking on a new era in radio.

"Are radio relays sufficiently developed so that television can depend upon them for distribution of its pictures from city to city?" Mr. Beal was asked.

"Yes, indeed," he said. "Radio can serve itself. Doing so would introduce a new form, or a new branch of radio communication. It will have to be less expensive, of course, than other methods, but there are encouraging indications that this will be possible and practical. Had radio relaying descended upon us at the advent of wireless, we would have looked upon it as a miracle rather than a new artery of communication. Automatic, unattended radio relay stations, located 20 to 50 miles apart, will link television stations into national chains. But the scope of this new development goes much further afield in communication than merely to hook up television transmitters, some of 50-kilowatt power.

"Think what these unattended radio relay stations promise to such vast areas as China, Russia and Africa; think what they will mean for countries which haven't enjoyed the splendid trunk line communication services as found in the United States and the British Isles. It is my belief that in the post-war era other regions will also have extensive trunk line systems of communication made possible by radio relays of telegraph messages, telephone calls, sound broadcasting and television. The routes of these radio relays will extend to any part of the world. They can go through the jungles, from island to island, across mountains and the polar wastes. Neither tropical heat, nor arctic snow, neither fog nor hurricane will 'cut' these global lines. They can be built to be practical, efficient, and foolproof."

Opening a drawer in his desk, Mr. Beal brought out a picture of a radio relay station as the engineers have envisaged it and made it part of their plans. It looks like a streamlined lighthouse with little bulging eye-like windows at the top facing to the four winds. Behind each of these windows is a highly directive centimeter wave antenna.

The radio relay system is to be no one-way ethereal street, as Mr. Beal charts it. Multiple channels make it all the more promising in efficiency, flexibility and service. The relay towers will handle numerous circuits, for example, down and back from New York to Washington. Furthermore, the circuits can be multiplied to any reasonable extent, not only to carry one television program but several simultaneously, as well as "FM" sound broadcasts, telegraphic traffic and facsimile. In fact, relay circuits should be among the busiest in the air.

The main relay system, envisaged by Mr. Beal, will be like a great inter-city spine, becoming interstate and eventually transcontinental. The ribs will spread to television stations. To illustrate its possibilities, he describes it as it is likely to function between New York and Washington: While the NBC television program is being broadcast from the aerial on top of the Empire State Building, a different program will be originating in Washington. Both programs will be fed simultaneously into the relay system leading from Manhattan Island through Philadelphia to the Nation's capital. One Philadelphia station can elect to broadcast the program from New York, while another taps the relay channel carrying the program staged in Washington.

Also, if a New York station, aside from the NBC transmitter, desires to broadcast the Washington program, it can do so by tapping the relay channel. In this way, the relay system becomes a trunk line that can be tapped at will by the television stations, thereby affording greater freedom of program selection and operation. The relay enhances variety in programming, because there may be four or five relay channels simultaneously car-

rying different programs, which can be selected by the main television stations.

In addition to this main system, there are supplementary methods of operation. In the simplest form the relay stations might serve as links in a chain of stations. For example, if one of these "radio lighthouses" were located atop the Orange Mountains in New Jersey, its eastern "eye" might intercept pictures from the NBC station on the Empire State Building in New York, and "bounce" them along to the stations in other directions within a 50-mile radius.

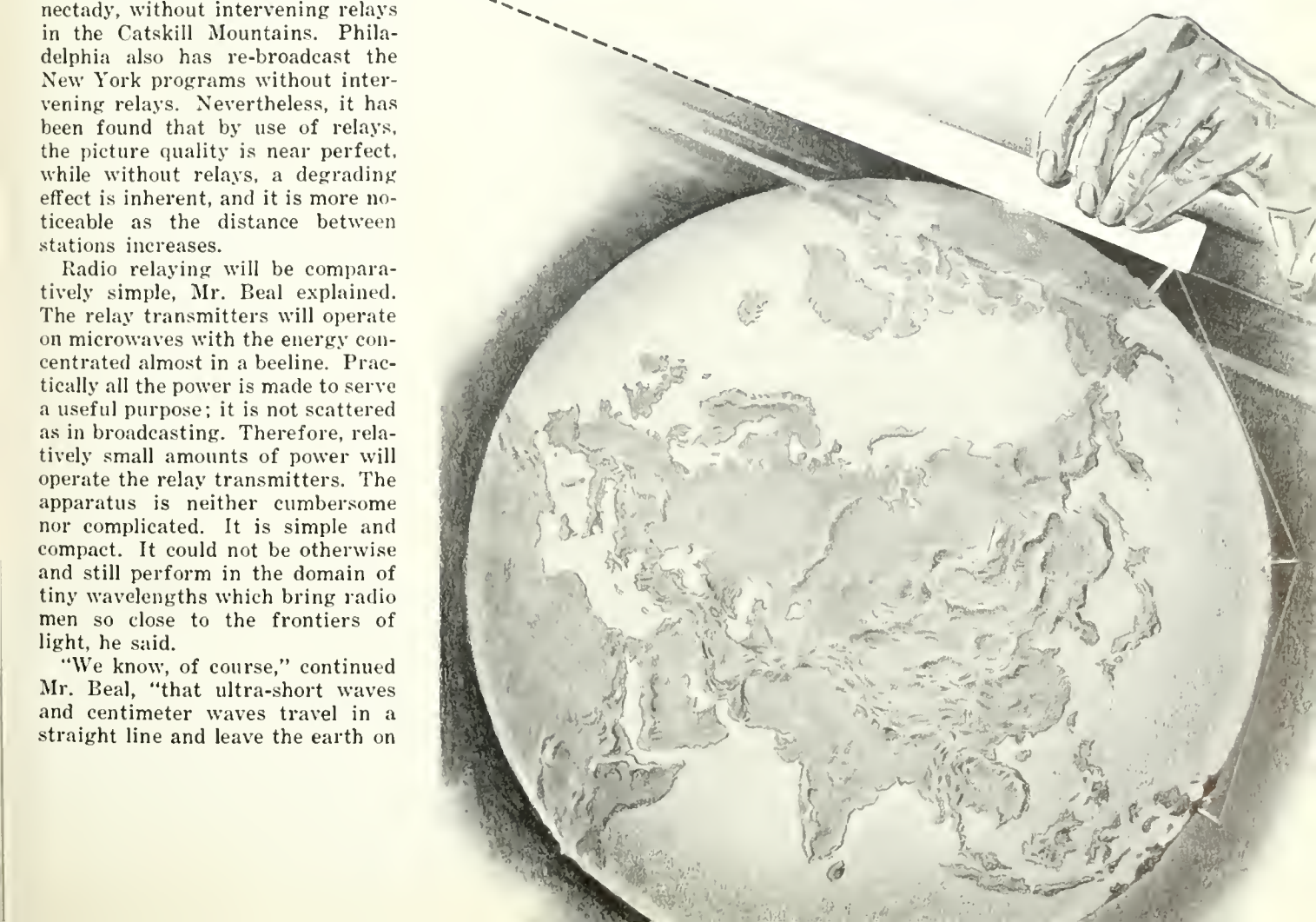
Standard television stations within that area would intercept the pictures and re-broadcast them to homes. Simultaneously, these standard stations, as well as the relay stations within the 50-mile circle, would toss the pictures beyond the horizon to be picked up by other stations and relayers. Already telecasts from New York have been intercepted 129 miles away, at the Helderberg Mountains, near Schenectady, without intervening relays in the Catskill Mountains. Philadelphia also has re-broadcast the New York programs without intervening relays. Nevertheless, it has been found that by use of relays, the picture quality is near perfect, while without relays, a degrading effect is inherent, and it is more noticeable as the distance between stations increases.

Radio relaying will be comparatively simple, Mr. Beal explained. The relay transmitters will operate on microwaves with the energy concentrated almost in a beeline. Practically all the power is made to serve a useful purpose; it is not scattered as in broadcasting. Therefore, relatively small amounts of power will operate the relay transmitters. The apparatus is neither cumbersome nor complicated. It is simple and compact. It could not be otherwise and still perform in the domain of tiny wavelengths which bring radio men so close to the frontiers of light, he said.

"We know, of course," continued Mr. Beal, "that ultra-short waves and centimeter waves travel in a straight line and leave the earth on a tangent at the horizon. The area of the earth's surface touched by such waves, is much like that touched by a stick held against a basketball. Obviously, if we use high towers or antennas on lofty buildings or mountain peaks, we capture and re-transmit the waves at higher levels, and therefore their effective range is lengthened. With the use of radio relay stations, the average range is about 30 miles, depending upon the terrain and various other factors. It is interesting to recall that an airplane over Washington, D. C., carrying a television receiver intercepted the pictures from the NBC aerial on the dome of the Empire State Building 200 miles away. But for such long distance reception of the ultra-short waves, the plane had to go up 20,000 feet."

"It is to be expected," continued Mr. Beal, "that television stations will first go on the air in such broadcasting centers as New York, Chicago and Los Angeles. But there is every indication that alert broadcasters will keep pace with them in such localities as Boston, Philadelphia, Washington, Pittsburgh, Cleveland, Detroit, St. Louis, Kansas City, Omaha, Denver, and San Francisco. It seems logical to assume that the first television network linked by radio relay stations, will be formed along the Atlantic Seaboard.

"But television will not be limited to the larger cities. The radio map will be dotted with stations in cities like Schenectady, Utica, Syracuse, Minneapolis, Erie, Buffalo, Louisville and many others. By the use of radio relays, these too will become outlets for the television network which before many years pass after the war, will weave from the east across the Mississippi and the mid-west plains to meet a Pacific Coast link striking eastward across the Rockies. A relay station atop Pike's Peak might well be the key station to complete a transcontinental television chain.



"It seems clear that the tree of radio development is about to spread new branches extending in many directions," said Mr. Beal. "The roots of post-war radio television are in the soil of wartime research. They are being cultivated by radically new electron tubes. Radio is being prepared for vision. All America will go radio sightseeing, for science is equipping the United States with a new optic nerve."

Responding to Mr. Beal's enthusiasm and confidence in nation-wide television, the interviewer asked whether international television would some day be possible. If the ultra-short waves leap into space at the curvature of the earth, how could they ever be made to encircle the globe.

"I firmly believe that we shall find the key to world-wide television," said Mr. Beal. "Radio history will repeat itself. Broadcasting started locally in big cities and rapidly extended to smaller towns encompassing a vast audience. Gradually, east and west coast networks were formed, and in 1927 their wire tentacles met in the Rockies and we had the first transcontinental hookup.

"Then, before many years, short-wave stations linked the continents and international broadcasting was achieved. The pattern for television will be much the same. The post-war world will be ready for it; television promises to be one of the great contributions of science to the new world. It symbolizes the spirit of the United Nations by bringing new vision to all people regardless of race, color, or creed.

"Just think what television trunk lines will mean to China," continued Mr. Beal. "I have been there and I feel that I know how welcome the new art of radio relaying will be to the millions of Chinese, for it will bring them communications, entertainment, and education on a scale they have never known. What a gigantic task it would be to wire all China and its great open spaces for sound. But how much easier it will be to do the job by 'wireless,' to dot the countryside with relatively inexpensive radio relay transmitters that will give to China a trunk line system of communication for television, radio, telephone and telegraph. Even the Himalayas will be no barrier to such radio relaying. Their high mountain peaks will speed the process, for relay stations at such altitudes can reach far beyond the horizons of the valley. China will then have a new Burma Road—a road of television.

"Of course, you will understand," said Mr. Beal in concluding the interview, "that I have spoken of these technical developments from the standpoint of the engineer. I realize, as do others, that it will take money to establish such a radio relay system as I have described. Indeed, it will take more than money. It will require a sympathetic and helpful attitude on the part of Governmental agencies concerned with licensing and regulation and the daring spirit of the American industrial pioneers who have led the way in so many new developments."

---

Radio engineers know that scientifically, and technically, radio relay transmitters are practical and efficient. These stations are no overnight development. Great headway had been made long before the war. As early as 1932, field tests of 240-line electronic television were conducted by RCA at Camden, N. J., with pictures from New York relayed through an automatic station at Arney's Mount, near Trenton, N. J.

Further revealing the utility of this system, in June, 1936, RCA demonstrated a facsimile ultra-short wave radio circuit connecting New York and Philadelphia with radio relay stations at New Brunswick and at Arney's Mount.

Demonstrating continued progress, in 1941, RCA relayed television pictures by radio from Camp Upton, Long Island to New York. As a feature of the test, pictures from the NBC transmitter on the Empire State Building were picked up at Upton by a mobile television unit, which relayed them across 17 miles to Hauppauge from which point they were "bounced" to Bellmore for direct 28-mile relay to Radio City for reproduction on a 20-foot theatre screen as well as on home-receivers.



# Phosphors Brighten Radio Future

*HIGHLY EFFICIENT LUMINESCENT MATERIALS, DEVELOPED BY RCA RESEARCH, OPEN NEW FIELDS OF APPLICATION—BENEFITS MAY EXTEND TO HOME, HEALTH, SCIENCE, AND INDUSTRY*



By H. W. Leverenz

*RCA Laboratories,*
*Princeton, N. J.*

ONE dark night in mediaeval Italy, a weird blue glow started a sequence of experiments which led to electronic television, fluorescent lighting and a score of other useful services catering to the human eye. The glow was observed by Vicenzio Casciarolo, a Bolognese alchemist, who, in 1603, observed light emanating from some white barite rocks which had been accidentally heated with charcoal in his forge. Casciarolo's material had the amazing facility of absorbing daylight and then emitting a feeble blue light during the night. Similar materials, though vastly improved, are now called phosphors, or luminescent materials, and are produced in hyperclean laboratories or special factories for use in war and peace.

Development and use of phosphors languished for more than three centuries until electronic television research, pioneered principally by RCA, devised highly efficient luminescent materials capable of glowing in practically any conceivable color. Prior to the advent of television, phosphors had had only minor application in radioactive watch dials, x-ray fluoroscope screens, and theatrical "black magic", each of which required negligible amounts of material.

Television research on phosphors yielded at least one product which may be likened to the tail which wagged the dog. The new luminescent material became the keystone of the tremendous luminescent lighting industry which dwarfed television within a year after its inception. The particular phosphor is a beryllium-containing silicate which exceeds the tungsten filament in efficiency of light production and may be made to emit almost any color in the major portion of the rainbow spectrum. It found immediate application as the screen which converts electron energy into a visible image in television, but its main use is as the principal constituent in the light-producing coatings of white fluorescent lamps.

Phosphors are synthesized as clear, tiny crystals measuring about one ten-thousandth of an inch in size. These crystals gleam like miniature diamonds when viewed under a microscope. Phosphors are unique in being able to do the following:

1. Instantaneously transform invisible radiations, such as cathode rays (swiftly-moving electrons) or ultraviolet, into visible light.

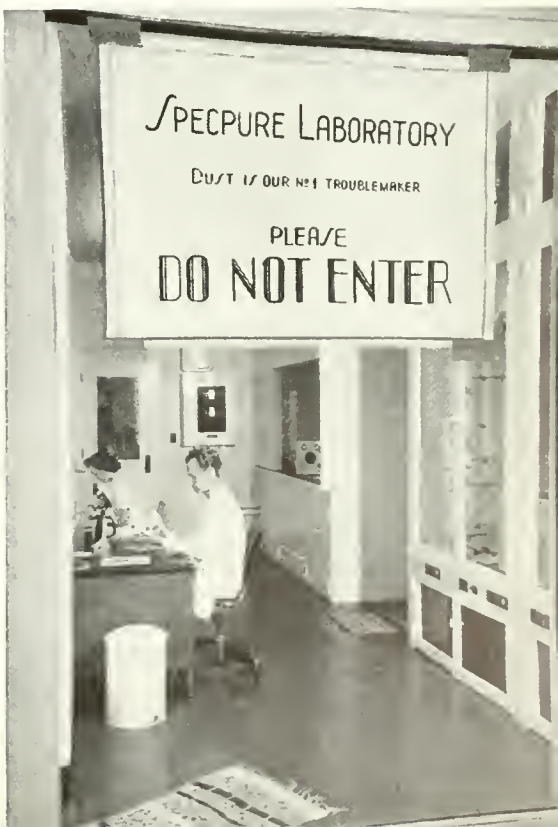
2. Store light, or "remember" information, for controllable time intervals lasting from less than a hundred-thousandth of a second to more than a day.

3. Convert electric power into white or colored light more efficiently than any other known practical means.

Some of the properties of phosphors have ranges which are astronomical in magnitude. For example a phosphor may be made to glow for several minutes after a fleeting excitation lasting less than one millionth of a second. The same phosphor will produce visible light under impingement of electrons accelerated by as little as six volts or as much as six million volts. Furthermore, some phosphors are so sensitive that electron beam currents smaller than one one-hundred-millionth of an ampere suffice to excite discernible luminescence, whereas the same materials, in coatings as thin as tissue paper, can withstand high voltage electron bombardment of intensity adequate to crack an underlying Pyrex glass disc.

The aforementioned extraordinary qualities are not possessed by ordinary materials. Sugar, salt, window glass, quartz, diamond and other commonly known substances luminesce only faintly under cathode rays or ultraviolet. Such substances lack the delicate, though sturdily incorporated, arrangement of certain cooperative and electronically-active atoms present in phosphors. Then, too, ordinary materials are far too impure and too imperfectly crystallized to be respon-

NO VISITORS ARE ALLOWED IN THE DUSTLESS RCA CHEMICO-PHYSICS LABORATORIES AT PRINCETON, N. J. MOISTENED RUGS TRAP ANY SHOE-BORNE DIRT.





E. J. WOOD, RESEARCH CHEMIST, MANIPULATES A BUBBLING GAS TO PURIFY A SOLUTION WHICH IS BEING ELECTRICALLY HEATED AND SHAKEN IN THE PYREX FLASK.



H. W. LEVERENZ HEATS PHOSPHOR INGREDIENTS TO THEIR REACTION POINT AT 2500°F. THEY ARE THEN COOLED AND CRYSTALLIZED AS ULTIMATE PHOSPHOR CRYSTALS.

sive to the low energy excitations which are sufficient for good phosphors.

Oddly enough, the ingredients comprising phosphors must be painstakingly purged of all impurities in order that one or two useful "impurities" may be deliberately added. The chemicals used for the preparation of phosphors are purchased in the purest obtainable form and are then subjected to lengthy purifications carried to a state far beyond "chemically pure" or even "spectroscopically pure." In fact, a new term has been introduced into the scientific vocabulary, "luminescence-pure," meaning free of undesirable constituents to a degree which, numerically speaking, exceeds 99.9999 per cent. Apropos of the detrimental effect which impurities may have on luminescent materials, it may be mentioned that a television phosphor of the zinc sulphide type loses 25 per cent of its pristine efficiency if as little as 0.0001 per cent of nickel is left in the material. On the favorable side of the ledger, however, the efficiency of the same phosphor may be increased 100 per cent by the addition of only 0.0001 per cent of silver.

It is obvious that successful phosphor research must be performed in spotless laboratories. In the chemico-physics rooms of RCA Laboratories at Princeton, N. J., the laboratory air is made dust-free by thick filters and large electrical precipitators which remove even submicroscopic particles. Laboratory personnel are required to change to clean white clothing before entering the inner rooms. Water, the essence of chemical operations, is redistilled four times in electronically-controlled Pyrex and quartz stills. Acids are redistilled in quartz and platinum stills. The laboratory construction and most of the equipment are of commensurably special design, since standard apparatus or methods are inadequate for the task of divorcing chemical elements from their inherent impurities.

Purification rubs nature the wrong way. There is a ceaseless natural tendency for all things to mingle and become chaotic. This inexorable mixing process is called entropy in scientific parlance. The relentless increase of entropy reputedly shares with the unvarying speed of light in a vacuum the distinction of being one of the two absolute properties in the relativistic scheme of things known to man. Victory gardeners who have striven to eliminate every weed from their plots can appreciate the exasperating persistence of nature in trying to attain homogeneity of matter. The segregation of myriads of invisible atoms from their similarly constituted impurities, until less than one in ten million of the latter remain, is a task to strain one's perseverance and skill.



R. H. PLUMLEE, PHYSICAL CHEMIST, AND MRS. W. F. KASER, LABORATORY ASSISTANT, ANALYZE AND MIX PURIFIED PHOSPHOR CONSTITUENTS. COMPARTMENTS PREVENT CROSS-CONTAMINATION.

Crystallization, the final step in the synthesis of a phosphor, is relatively brief but spectacular. A quartz or platinum crucible, filled with the precisely compounded mixture of pure ingredients, is placed in an electric furnace operating at 2000-3000° F. At the elevated furnace temperature, the haphazard agglomeration of the various chemicals becomes mobile and, naturally, the different varieties of atoms commingle to a homogeneous mass on a molecular scale. After some minutes, the white hot crucible contents are withdrawn from the furnace and allowed to cool. As the cooling proceeds, the slithering atoms move more and more sluggishly until, at the crystallization temperature, the entire assemblage locks into perfect three-dimensional rows which are characteristic of a true crystal. The crystallization process is analogous to the manner in which trained soldiers snap out of the sprawling confusion of "at rest" into neat marching array.

An accurately organized crystalline condition is essential to good phosphors. The luminescent mechanism usually involves electron transfer through extensive regions within the crystal. Manifestly, electron transfer would be seriously impeded if the mass were a disordered jumble such as exists in glass, amorphous solids, and other noncrystalline materials.

Incongruously, it is necessary to have carefully devised imperfections scattered sparsely throughout the otherwise faultless phosphor crystal. Such scientifically produced faults are essential for persistent luminescence. The desired imperfections provide temporary halting places or traps for the electrons engaged in the luminescent processes. Minute concentrations, viz., one part in a million, of certain "foreign" elements such as copper are suitable for this purpose.

A very diminutive Alice in Wonderland who could act as an observer when a swift cathode ray or quantum of ultraviolet struck a phosphor crystal, might report the following happenings. One of the "bombed" atoms in the crystal would be stripped of its least tenacious electron, which electron would wander through the crystal until it was trapped in one of the few imperfections. Some time later, latent heat energy would again liberate the electron so that it could once more wander about until it chanced near its own "home" or another vacant site. On close approach, the electron would dive into the parent haven, which would acknowledge receipt by emitting a momentary scintillation of light. Multiply that simplified act by "skintillions" and you have an inkling of the process whereby electric energy is converted into a television image or into a flood of light from a fluorescent lamp. The electron guns of television Kinescopes or the invisible radiations from agitated mercury atoms in fluorescent lamps furnish the cathode ray or ultraviolet quanta "bombs" which excite light from phosphors.

Testing of the completed phosphors is an art unto itself. It is necessary to provide and measure both visible and invisible radiations with accurate determinations of intensities ranging from those of starlight to that of sunlight. Ingenious high-voltage electronic equipment is used to measure atomic spacings in crystals, wavelengths and energies of luminescent light, surface potentials of phosphors,



TWO QUARTZ AND FIVE PYREX ELECTRONICALLY-CONTROLLED STILLS FURNISH QUADRUPLY DISTILLED WATER AND ACIDS —THE "LIFEBLOOD" OF LABORATORY OPERATIONS.

and many other pertinent data. One rather impressive apparatus, the electronic phosphoroscope, makes measurements of light intensity within time intervals as short as millionths of a second or as long as days after excitation of the phosphor has ceased.

Our present knowledge of phosphors is far from being exact or complete. Despite the great forward steps of the past decade, research on luminescent materials still relies considerably on scientific intuition for its direction. This state of affairs reflects the defiance of the subatomic domain with respect to science's attempts at detailed investigation.

Although it is not possible to guarantee the predicted properties of untried phosphors, many luminescent materials have been custom-made to fulfill special require-



DR. R. E. SHRADER, RESEARCH PHYSICIST, TESTS COMPLETED BUT UNTRIED SYNTHETIC PHOSPHORS WITH A RECORDING SPECTRORADIOMETER.

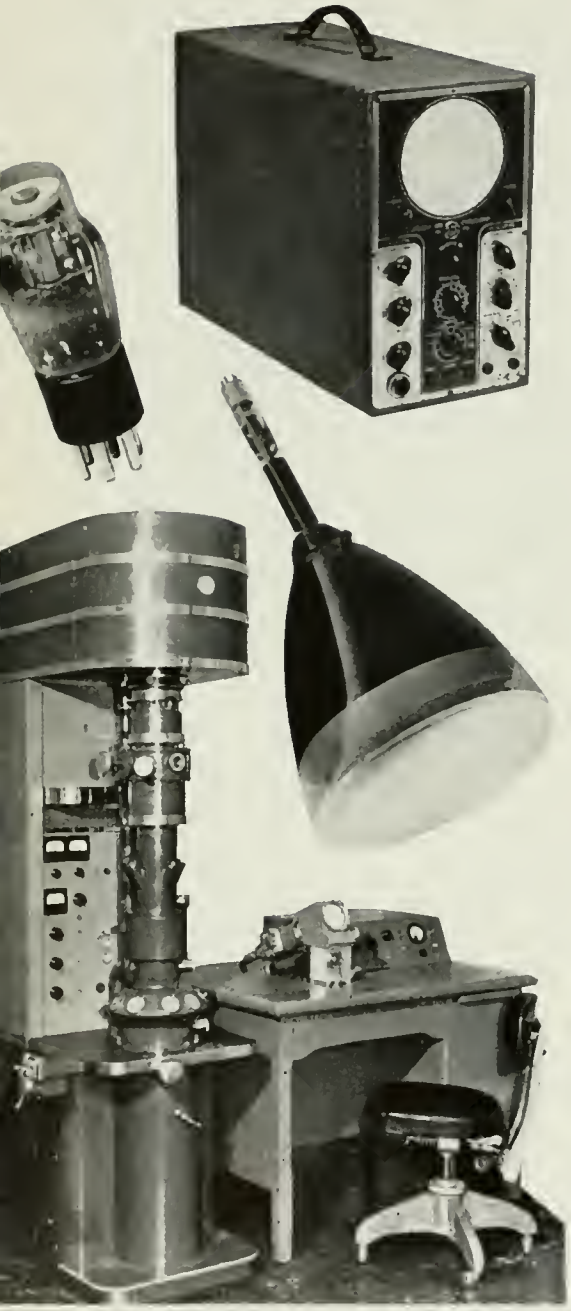
ments. This type of "aimed," or vector, research has been especially valuable in problems arising from our wartime needs.

The abnormal conditions incidental to the present world conflict, reemphasized the folly of labelling any scientific development as useless. For example, some of the thousands of phosphors synthesized prior to the war had unusual properties, but low efficiencies. They were promptly ignored during the search for greater brilliancies required by television and lighting. When blackout conditions were imposed, however, the despised phosphors received careful reconsideration because the dark-adapted eye is some 200,000 times as sensitive as it is in daylight vision.

When this war ends and our fighting men return, they will have an opportunity to help achieve a resplendent new electronic era. In that era, phosphor crystals in fluorescent lamps will inexpensively illuminate workplaces and homes or gaily brighten the streets of our cities with varicolored sign tubing. Other phosphor crystals will display news and entertainment on the screens of our television sets which may be tuned by the light from phosphors in Magic Eye tuning indicators. Kindred phosphors in the screens of electron microscopes will aid in fathoming the mysteries of bacteria and molecules in order to ensure a healthier and happier life.

There are a number of other possible uses for phosphors, including intense light sources for sound recording and theater projection; indirect illumination wherein the very walls, ceilings, and murals luminesce to illuminate as well as decorate the room; luminescent plastics in thousands of forms to make night-time safer and more colorful; and phosphors emitting specific radiations for controlled treatments of living tissues and organisms.

Casciarolo's eyes undoubtedly widened with amazement when he first spied that weak blue glow one night in the year 1603. His eyes would probably pop were he to witness phosphors in action today. It would be fun to show him our host of factories illuminated to daylight brilliancy with miles of cool fluorescent lamps requiring tons of phosphors. The *pièce de résistance*, though, would be to demonstrate to Casciarolo how a thin phosphor coating, only seven inches in diameter and four ten-thousandths of an inch thick, in a television projection tube, can amply illuminate a theater screen measuring 15 by 20 feet.







TOP: RCA OSCILLOGRAPH, THE PHOSPHOR SCREEN OF WHICH INDICATES ELECTRICAL FLUCTUATIONS.

MOTION OF A FLUORESCENT PATTERN IN THE RCA "MAGIC-EYE" TURE INDICATES PRECISE TUNING OF RADIO AND TELEVISION SETS.

THE KINESCOPE IS A FUNNEL-SHAPED TUBE, THE FLAT FACE OF WHICH IS A FLUORESCENT SCREEN ON WHICH THE TELEVISION PICTURES APPEAR.

THE RCA ELECTRON MICROSCOPE MAGNIFIES MORE THAN 100,000 DIAMETERS WITH THE PICTURES APPEARING ON PHOSPHORIC SCREENS.

IN TELEVISION RECEIVERS, KINESCOPES OF THE TYPE SHOWN ABOVE REPRODUCE IMAGES AS BROADCAST.

LOWER RIGHT: FLUORESCENT MATERIALS IN LAMPS MAKE POSSIBLE BRIGHT AND EFFICIENT ILLUMINATION.

# Radio Reports the War

## NBC NEWS DIRECTOR SEES BROADCASTING'S ROLE IN COVERING THE PEACE EQUAL IN IMPORTANCE TO WARTIME NEWSCASTS



By William F. Brooks

*Director of News and Special Events, National Broadcasting Company*

RADIO has taken its place in the news picture — with a bang—in the past five years. News always has been a part of radio programming, and radio has served the public from its inception with a certain quota of news broadcasts. In the past five years, however, news has come to the forefront in a way which few people expected prior to that time.

For twenty-five years, I have been in the news business and have watched the developments in radio news very closely. For fourteen years of that time, I was with the Associated Press. In 1937, I went to Europe and when I came back I went into radio. I took up the job of Director of News and Special Events of the National Broadcasting Company with a great deal of trepidation. I had been told it was a strange new world and that none of my news experience could be adapted to it easily. Fortunately, I have found this is not so. Hundreds of problems newspaper and press association men have to settle every day also have to be settled in radio, and because radio is so new compared to press I find that radio news men have borrowed heavily from the practices and procedures which have been standard in newspapers for scores of years.

In the News Department at NBC, we are charged with the writing and preparation of straight news broadcasts, the scheduling and contact with commentators, the arranging and covering of foreign pickups and the handling of special events. Up to the time the material actually goes on the air, the collection, preparation and organizational work required parallels to a large extent that of a press association or a newspaper. We have our news writing and special events staffs in New York, Washington, Cleveland, Chicago, Denver, San Francisco and Hollywood. Most of these men have spent a large part of their lives in newspaper work. I have found that virtually all of them have carried into radio the high principles and awareness of their responsibility to the public which was their daily fare in newswork.

Because of the difference in the method of dissemination, radio does have its special problems and certainly as many things can go wrong as quickly as on a newspaper. As a matter of fact, I think, more quickly! All of my newspaper life the minute hand on a clock regulated activity. As an executive editor of a press association, I have been on the receiving end of messages from some managing editors on occasions when the fact that an opposition service was two minutes ahead with a flash was conveyed in language none of us could permit on Page One, or on the air. In radio, it is the second hand that counts.

In England, I remember being quite amused when the BBC would end a program and leave you hanging on dead air for two or three or even several more minutes until it was time for the next program to begin. I really didn't appreciate what it requires to synchronize a broadcasting schedule as we do in American radio so that one program will slip smoothly into the next, and that switches from one point to another take place with clocklike precision.

Many things can botch a program —politics in Africa, for instance. John MacVane, who covered the African campaign for us, told me that he and Charles Collingwood of CBS both suffered a sort of sabotage. It seems that when they were broadcasting from Allied Headquarters in the early days of the African campaign, there were four French engineers attached to the station. Two were pro-Ally and two were pro-Vichy. When the pro-Ally men were on duty in the control room the signal was usually fine and clear; when the pro-Vichyites were operating, the broadcasters sounded like they were talking into a barrel, the engineers fiddling with the control knobs and generally making it difficult for the radio news men.

When I heard that story I couldn't help but remember a similar incident from my own newspaper work. I was a reporter on a middle-west newspaper and the printer in the back shop had a pet peeve against the chief of police of the town. Maybe the chief had given him a parking ticket, or

DON HOLLENBECK, NBC CORRESPONDENT ATTACHED TO ALLIED HEADQUARTERS IN THE TURBULENT AFRICAN CITY OF ALGIERS, COVERS THE FIGHTING FRONT IN ITALY BY AIRPLANE.





JOHN MAC VANE, NBC WAR REPORTER IN ALGIERS, BROADCASTING TO THE UNITED STATES FROM ALLIED NORTH AFRICAN HEADQUARTERS.

something. But in several months of painstaking effort I will swear I never was able to get any story into the paper about the chief without something going wrong. The slug with his name would be accidentally turned, the spacing would be off, or the name would be misspelled, even after the most careful proof-reading on my part.

Regular news broadcasts from abroad had been the business of radio for several years prior to the Munich crisis of 1938, but that event made them almost a daily necessity from then on. With the devil's brew of Europe thickening day by day, the National Broadcasting Company at once multiplied its foreign staff of reporters many times over. Instead of offices only in London, Paris, Geneva and Shanghai, a foreign staff was swiftly recruited in every important capital in the world, especially those of the likely belligerent nations.

### *Reporters Standing By*

There were three requisites for membership on this staff—first, knowledge of news; second, a good speaking voice; and third, American citizenship. Long before the actual outbreak of war, there were NBC reporters in every European capital and most of those in South America, as well as in Tokyo, Manila, Batavia, Singapore, Sydney, Alaska, and scattered throughout Africa from Cairo to Johannesburg. Today—four years later—only two of those forty-five reporters are still at their same posts. They are John MacVane in London and Grant Parr in Cairo. The others have been shifted to other points, or have been recalled home, or are in Japanese internment camps. Their successors are carrying on.

Today, several important news areas have been eliminated from American loudspeakers, principally Berlin, Tokyo and Rome. In addition to Axis territory, listeners hear only occasionally from the neutral countries in Europe, although NBC is well staffed in every neutral capital there. These reporters are continually standing by for word from New York that they are wanted in front of their microphones, either for a special program or for the daily NBC roundups of international news at 8:00 a.m. and 7:15 p.m., EWT. Each Thursday, radiograms go out from New York telling each reporter abroad, to the exact minute and second, just what broadcasting time has been assigned him for each day of the following week. These radiograms may read like this:

"ROMAG
MOSCOW
WANT 1208 1210 TUESDAY
THURSDAY SATURDAY
ALSO 2319 2321 MONDAY
ETTHURSDAY RETURNING
NEWYORKWARD CONFIRM"

This sounds like nonsense, but the numerals are Greenwich Mean Time. Instead of radioing Henry Cassidy in Moscow that he should be prepared to broadcast from 8:10-8:12 a.m. EWT, on the following Tuesday, Thursday and Saturday, a time is given to him in Greenwich Mean Time. Greenwich Mean Time means ten minutes after noon in Greenwich, England, where the parallels of longitude begin. All he has to do is consult a chart which tells him what time it is in Moscow when it is 12:10 p.m. in Greenwich, England. That is the time that he goes to the Studio in Radiocenter Moscow, and begins his broadcast. Cassidy has no contact with NBC in New York or anywhere else just before or during his broadcast. He arranges with Radiocenter to broadcast his talk by short wave from Moscow on certain regular frequencies—for instance, 15,750 kilocycles for the 8:00 a.m. show in New York and 11,948 kilocycles for the 7:15 p.m. program.

### *RCA Relays Signal*

Meanwhile, NBC in New York has given an order to Radio Corporation of America to pick up a signal of the Moscow Radio on those assigned frequencies at that exact time. RCA picks up the signal at Riverhead, New York, far out on Long Island, and feeds it over telephone lines to the master control desk in NBC. From there, it is fed to the studio where the news program is being conducted. Then, just ten seconds before Cassidy is due to start broadcasting in Moscow, the "m.c." of the news show—who may be either John W. Vandercook, W. W. Chaplin, or some other well known news commentator—will say something like this: "Our next report comes from Henry Cassidy in Moscow. We take you now with the speed of light to the capital of the Russian Soviet. Come in Moscow."

Moscow is a "blind" pickup. That is, Cassidy starts on a time basis because Moscow Radio cannot contact RCA by short wave, due principally to the Russian censorship. Even at points where censorship is lenient—such as Chungking and Algiers—we sometimes have difficulty contacting them due to sun spots or other atmospheric disturbances, depending even on the time of day or night the broadcast is attempted. But if censors and atmospherics permit, RCA in New York can converse with the foreign broadcast point and arrange final details for the pickup, to the point of telling the pickup point "Go ahead" at exactly the time that the cue is given on the network by the NBC announcer.

This calls for perfect conditions and split-second cooperation by half a dozen operating points, including the commentator in the studio, the announcer who is pushing the buttons on the announcer's panel for his microphone, his production man

in the studio who holds a watch on the program, the engineer in the control room who must select Moscow or Algiers or Chungking from among several foreign signals and feed it into the network at exactly the right time, the men on duty at the office of RCA, the engineer in the Moscow radio station and his announcer and production man and perhaps half a dozen other people somewhere along the line.

One of these points is the NBC Special Events department, where a man sits in the control room beside the engineer and listens in turn to all the foreign signals ordered up for the program. He must decide which ones are worth feeding to the network and, if possible, bring them in at exactly the time wanted. Of course, on the Moscow signal all he can do is approve it as understandable to the listener and listen to the time checks which Moscow puts on the air for several minutes in advance of the program.

He hears the Russian announcer in Moscow saying over and over in English: "Hello, New York. Hello, the National Broadcasting Company. This is Radio Center Moscow calling the National Broadcasting Company for Henry Cassidy, who will be on the air at 3:00 p.m. and ten minutes by Moscow time. By Moscow time it is now 3:00 p.m. and eight minutes exactly. Hello, NBC. Hello, New York. This is Radiocenter Moscow calling the National Broadcasting Company for Henry Cassidy, who will be on the air in exactly two minutes from now."

### *Timing Is Problem*

The NBC Special Events man listens to the time checks, with his eye on the NBC clock. If Moscow is ten seconds faster than NBC, he must arrange for the switching cue to Moscow to be given ten seconds earlier than planned. If Moscow's clock is ten seconds slower than NBC's, he must arrange for the New York announcer to drag his cue—or eat up an extra ten seconds before calling in Moscow in order that there be no silence on the network. This sometimes involves cutting short the previous pickup point, which may be Australia, or London, or Algiers, and thus require the New York commentator to "ad lib" a quick cue to Moscow in order to make the switch on time.

This is only one of the problems involved. The Moscow signal may start strong and then grow weak or be interfered with by cross talk from another station on almost the same frequency, or by static, or sun spots, or the Aurora Borealis, or half a dozen other things. In that case it may be necessary to cut Moscow off the air and for the New York commentator to make a brief explanation and apology to the listener for the poor signal from Moscow.

There are a few foreign pickup points which the Special Events man in New York can contact direct just before their broadcast is wanted and thus check cues and timings with them, identify the broadcaster and afterwards give him the report on how his spot was received. This is true of London, Cairo, Panama, Bern, and Madrid. In addition to ordering the line from London to New York, NBC orders the New York-to-London half of the circuit also and thus can talk two-way with London before the broadcast. This is not true of many other points, which are received on one-way radio circuits.

This routine is followed on every news broadcast from abroad; rather, on every radio broadcast of any sort from abroad. It is duplicated many times a day, and the technique has been perfected to the point where nearly all broadcasts are delivered to the loudspeaker of the listener on schedule.

In handling such a 15-minute program of news from abroad, the NBC Special Events man sits at an object which resembles nothing so much as an old-fashioned school desk. On a panel in front of him, he has a dial with eleven channels on which he can, by turning a switch, monitor three signals fed up to him by RCA, also two signals fed by AT&T, as well as Station WEAF in New York, the rest of the NBC network, the announcer's office upstairs, and the principal New York stations of the other networks. In fact, he has two dials exactly alike, one of which controls a loudspeaker in his desk panel and the other which is fed through a pair of earphones. He uses the earphones to listen to one signal, and the loudspeaker to listen to another at the same time.

### *Other Things to Do*

In case this appears to call for ambidexterity, it may be said that he has several other things that he must also do at the same time. He has a telephone to the production man in the studio adjoining the control room; he has an inter-office telephone through which he can get any other 'phone in the building as well as outside points such as Washington, Chicago, etc. He has an emergency 'phone on which he can reach all of the six or eight operating points of NBC which must

EDWARD WALLACE, STANDING THIRD FROM RIGHT, IS CHIEF NBC WAR CORRESPONDENT IN THE SOUTH PACIFIC. THIS PICTURE WAS MADE DURING A TRIP THROUGH THE SOLOMONS AND NEW GUINEA.





RALPH HOWARD, ATTACHED TO THE AIR FORCE COMMAND IN ALGIERS, TYPES A NEWS STORY FOR TRANSMISSION TO NBC IN NEW YORK.

function in case of any change of program plans. Then he has a "super-duper" emergency 'phone on which he can reach only the three essential operating points, which are the master control desk, the traffic department, and the announcer's office. He also has a switch which he can throw to talk direct to the adjoining studio when it is not on the air. He also has an electric teletype machine which NBC contracts for by the year and which reaches all the stations across the country that are managed and operated by NBC, such as KPO in San Francisco, WMAQ in Chicago, and other principal network operating points such as Denver and Hollywood.

With these half dozen methods of communication at his command, a Special Events director can make almost any necessary last-minute change required in the program. He can tell San Francisco to tell Australia to hold up their broadcast for a minute or two minutes if necessary. On his telephone line to London, he can tell the London announcer to cut his spot ten seconds short or to take an extra fifteen seconds or whatever may be necessary in order to make the next switch on time. He can reach Washington on a direct line to tell the commentator there to switch to New York instead of Chicago, if that is required. He can reach RCA by direct line to inquire what's wrong with the signal from Stockholm and whether or not it may be expected to improve, if it is bad. He can tell Chicago to watch for a cue to reverse the network earlier or later than expected. By this we mean that if New York is feeding the network to the West Coast and back, and a switch to San Francisco is desired, then six seconds must be allowed for operating points such as Chicago and Hollywood to cut the network feed from New York and to open the channel from San Francisco so that when San Francisco takes the air six seconds later, the network program will then be fed eastward to New York and thence back to San Francisco.

Many a time we have torn up a regular news show and thrown out Australia or Moscow in order to get in a special broadcast from Cairo or Algiers, as the case may be. It involves ordering facilities from one of the communications companies, notifying the Engineering, Traffic, Announcing and Production departments, and frequently the various switching points between New York and San Francisco. If we cannot make room for the broadcast on the network, we always record the broadcast by transcription here in New York and also monitor it while it is on in order to check on the nature of the broadcast. Then, if it is important enough, we can always play the record on our local station at a later time. If the news is of greatest importance or the special feature has some historical value, we can sometimes play it to the network, too.

### *Best Possible Service*

At NBC, we have worked out a schedule of news broadcasts throughout the day which is intended to give the best possible service to the public. This program structure has been evolved from practical experience. We know there are certain people who turn their dials every few minutes to get a new news program, or a new commentator. But we also know that the majority of people like other types of information and entertainment mixed with their news broadcasts. To meet the increased demand for information, in the past few years NBC has stepped up its news coverage. In 1938, news reports, analyses, and special events took up 3.8 per cent of the total program time of NBC. In 1941 this had jumped to 10.5 and in 1942 it rose to 15.4 per cent.

### *No End of News*

As far as I personally am concerned, I think we have about the proper proportion now, and that it would be bad programming to step this up in any considerable amount. We feel that we are servicing the bulk of our listeners throughout the day and night hours very adequately.

Trade reporters have asked whether we expect to maintain this proportion when the war ends. That is a very difficult question to answer, but I think that news of the peace is not going to be any less important than news of the war. As a matter of fact, I think it will be even more dramatic in some respects, and will affect more people directly than news of the actual fighting.

I am sure this view is not a new one, but some people seem to have the idea that the minute an armistice is signed, there will not be any more interesting news. I believe there will be an increased interest, and that both press and radio will have one of their biggest jobs in keeping the people informed of the readjustments and compromises which will have to be made before the world can completely disarm and embark on any safe program for the future.

The war is developing new equipment, and we are on the verge of new service and a new industry through the wider use of ultra high frequencies in fields of television, frequency modulation and facsimile. These new services are certain to assert a revolutionary influence upon our social and economic life in the years to come—and it is just as certain that both the press and radio will adapt these new discoveries in their respective fields for greater service to the listening and reading public.



DIAMOND SAW OPERATOR AT CAMDEN PLANT OF RCA VICTOR DIVISION, CUTTING A NATURAL CRYSTAL WHICH, AFTER PROCESSING, WILL CONTROL RADIO AND ELECTRONIC APPARATUS.

# Radio Crystal Bottleneck Broken

*MIRACLE OF PRODUCTION AT RCA VICTOR DIVISION PLANT AT CAMDEN, N. J., SPEEDS OUTPUT OF COMPONENTS VITAL TO RADIO-ELECTRONIC COMMUNICATIONS DEVICES FOR ARMED FORCES*



By Harry E. Leroy

*Plant Manager,*
*RCA Victor Division,*
*Camden, N. J.*

AMONG the many miracles of American production to be credited with helping to turn the tide of the war against the Axis is the breaking of a critical bottleneck in crystals, a vital component of radio, sound and electronic communication equipment. The statement revealing the breaking of the bottleneck was made recently by the War Production Board, and it serves to focus attention on the contributions to the war effort made by the men and women of the RCA Crystal Manufacturing Department in Camden.

Paced by a rapid rise in demand for radio, electronic, and communication equipment for the armed forces following this country's entry into the war, crystal production expanded almost overnight from a small section of the Special Apparatus Department, occupying about two-thirds of a floor in the Camden plant, into a separate department, now occupying two complete floors and part of a third.

To meet the Government's imperative wartime need for crystals, RCA Victor within a few months recruited and trained enough new operators and technicians to swell the department's personnel to more than 800 per cent of its peacetime peak, and increased the production of crystals by 1,500 per cent.

The percentage of increase in production over that in personnel was in part accomplished by labor and material saving production refinements, credited to three sources: First, suggestions made by employees; second, advances made by the department's research engineers; and third, shortcuts developed by members of the laboratory's supervisory staff in the course of breaking down and simplifying procedures for new employees.

Encouraged and rewarded by the company through suggestion contests sponsored by the plant's labor-management War Production Drive Committee, workers in the Crystal Manufacturing Department have submitted since Pearl Harbor a total of 700 ideas to conserve time and materials and improve production. Of this total, 155, or 22 per cent, have been found practicable and adopted. Fifteen workers are members of the RCA Century Club, highest distinction awarded by the company for excellence of employees' suggestions. Robert W. Young, a crystal finisher, was top winner for all RCA Victor plants in the recent suggestion contest climaxed by participation of the winners in a Victory ship launching at Mobile, Alabama.

The special value of quartz crystals in radio and electronic equipment is their piezo-electric property—that is, their ability to convert electrical energy into mechanical energy, or mechanical energy into electrical energy. Since the frequency of the crystal is determined by its thickness, crystals of varying thicknesses can be used to control the frequency of an oscillating circuit.

Although such a circuit can be and has been made and operated without crystals, the precision control which crystals afford is essential in modern transmitters, in single-frequency receivers such as those used in police radio, in two-frequency receivers of the type used by the armed services in "walkie-talkie" sets and tank unit communication equipment, and in other equipment.

### *Function Is Outlined*

The function of the crystal in such equipment is analagous to the function of the balance wheel in a watch, or the pendulum in a clock, serving to regulate the entire unit and keep it "on time," or, in the case of radio, "on the beam."

Staffed with a few seasoned experts headed by Walter Groeber, manager, the Crystal Manufacturing Department was established in the Camden plant in 1932 as a "short order" or "model" shop for maintenance engineering, to undertake the production of crystals on a small scale, largely for internal use in test equipment. Within the next two years, it developed into a research unit and a modest commercial manufacturing unit. Working relationships between the manufacturing and engineering staffs were close from the start. Normal growth through the next eight years brought the personnel of the laboratory up to 80 by the winter of 1941-42.

Meantime, in the fall of 1941, there had become apparent the need for mass production of crystals for military and naval requirements of America's defense program, and plans had been laid for the design and production of the necessary manufacturing equipment.

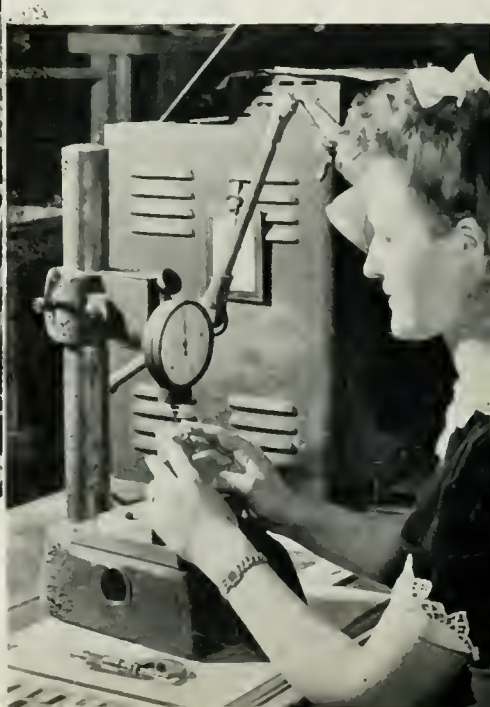
Expansion in space and personnel began shortly after Pearl Harbor, and by October of 1942, the department was manned by a peak staff of about 700 workers. The late Summer of 1942 brought the beginning of a rapid climb in production, which rose a total of 1,500 per cent in the next six months.

In the initial personnel recruitment which raised the staff from 80 to 700, both men and women were employed, but the male element remained in the majority. As more and more men were lost to the armed forces in later months, however, it became necessary to adapt the work to the capacities of women workers and establish a comprehensive training program, since few women were available who had acquired either training or experience in this field. Special machinery was designed and various techniques were altered to permit the mechan-

THESE GIRLS SOLDER AND ASSEMBLE CRYSTAL HOLDERS FOR USE IN RADIO AND ELECTRONIC EQUIPMENT FOR THE ARMED FORCES.



ANNA MAY GALLAGHER, RCA VICTOR WAR WORKER, GAUGES THE THICKNESS OF CRYSTAL BLANKS.



ization of operations which the new workers could not perform by hand.

Success in this effort is evidenced by the fact that women constitute approximately 65 per cent of the present staff. Aided by training under skilled employees, both on the job and in the company's own classrooms, and by the preparatory breaking down and simplification of procedures, women and girls are proving highly proficient.

The necessity for cutting the raw quartz along carefully predetermined lines to prevent damage and obtain the required angles, plus the need for grinding the finished crystals to precise dimensions (often too fine to be measured mechanically), makes the cutting and finishing process an exacting one.

The ideal natural crystal, or "mother" quartz, is a six-sided prismatic body, capped at each end by an apex. However, since larger crystals are generally found protruding from clusters of smaller crystals, bound by other rock formations, the usual method of mining involves breaking the larger crystal off near its base in the cluster. When it comes into the market from Brazil, where the bulk of this mineral is mined, it usually consists of only part of the body and one apex. A "mother" crystal suitable for crystal manufacturing use may weight from a few ounces to about 30 pounds, but the average now coming into the market weighs about one pound.

When the natural crystals arrive at the laboratory, trained crystal layout specialists determine the three primary angles on the basis of which they should be cut. These angles are clearly indicated by the shape of a regular six-sided crystal, and methods involving the use of light have been devised to find these angles in irregular-faced crystals.

### *Examined By X-ray*

Once determined, the angles are marked on the crystals to guide the operators of the diamond saws used to cut the thin sections, known as blanks, from which finished crystals or plates are to be processed. The first saw sample is examined by X-ray to insure the proper angle before more blanks are cut.

The blanks are next immersed in a chemical solution to reveal possible defects, which, when found, must be cut out of the blank. After further processing, the edges of the blanks are squared up and the blanks are individually inspected and sorted according to their thickness.

Automatic equipment then grinds them to prefinished dimensions and they are tested for oscillation, sorted to various frequencies, and each is tested against a master crystal to permit adjustment to final frequency. The finished crystal is then ready for installation in the holder in which it will function, but before the cover is sealed on the unit it must again be inspected and tested at various temperatures.

The final test involves placing the sealed units in an automatic test equipment with adjustable temperature controls, to check performance under conditions ranging from extreme cold to extreme heat. If any one of the units fails to function properly in these temperatures, either as to frequency or activity, it is set aside for reworking.

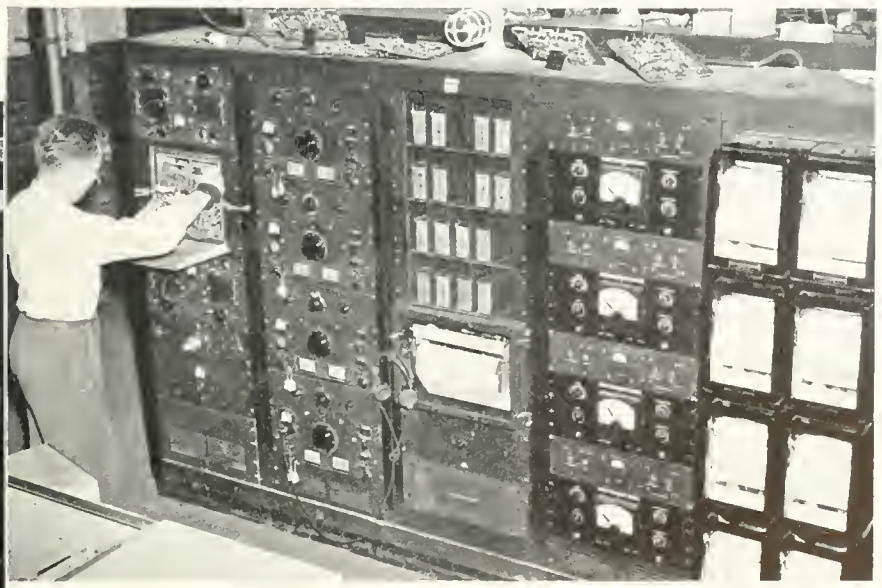
Maintaining its high level of production, the crystal department is now producing each month considerably more than the total of a year's production before the war. Scheduling has at times been a challenging problem, due to sudden changes in requirements based on battle experience of the armed forces, but that challenge has been met.

Buy War Bonds

KATHERINE DANLEY LOADS AN AUTOMATIC DRUM TO GIVE THE FINAL TEST TO CRYSTAL BLANKS. THE DRUM REJECTS BAD CRYSTALS AUTOMATICALLY.



HERBERT RATNER WORKING WITH QUADRUPLEX AUTOMATIC TEST EQUIPMENT USED IN FINAL TEST FOR MISCELLANEOUS TYPES OF CRYSTAL.



# Engineers Predict Radio Weather

*RCA RESEARCH GROUP THROUGH LONG OBSERVATION OF SUN SPOT ACTIVITY AND OTHER SOLAR PHENOMENA CAN FORECAST COMMUNICATION CONDITIONS ON WORLD-WIDE CIRCUITS*



By Henry E. Hallborg
*Communications Research, RCA Laboratories, New York*

A TELEPHONE rings in the Communications Research office of RCA Laboratories at 66 Broad Street, New York City. The engineer answering gets the query:

"What are radio conditions going to be between now and the end of the month?" He refers to a chart on his desk, and replies:

"The 17th will be moderately disturbed, the 26th and 27th severely disturbed, but otherwise quiet."

Simple? Yes, but the development of means that enables such forecasts, which have become practical aids to the international communications services of RCA, and of other organizations, is another story.

Radio weather must not be confused with rain, fog, pressure and temperature at the earth's surface. It pertains to the condition of electrified layers far above the earth. These solar-created layers enshroud the earth like onion skins. Those which affect radio weather exist at altitudes ranging normally from seventy-five to 250 miles, in the form of free ions in a vacuum as perfect as the finest radio tube. Atmospheric air and storms, on the other hand, occur in the "troposphere" extending not more than ten miles above sea level. It is the outermost of the earth's layers, the "ionosphere," that determines radio weather. Solar radiation activity is the generator of conditions prevailing in this "radio roof."

The sun sends us light and heat. It also sends us radiations of many wavelengths, ranging from deadly actinic rays, which are fortunately dissipated in the "ozonosphere" at about thirty miles up, to the slower rays which are manifested by terrestrial magnetic disturbances. Actinic and light rays take 8⅓ minutes to travel from sun to earth. The rays creating magnetic disturbances may require from one to three days to bridge the 93 million-mile gap. These slower rays originate in spot group areas on the sun.

Sun spots have been observed and charted for centuries. Their existence took on practical significance when their characteristics and cycles were found to have a close relationship to radio transmission. The occurrence of a sun spot group was found to coincide with a series of radio circuit interruptions. This series of disturbances may be repeated, with more or less fidelity, after a solar rotational period of twenty-seven days. In addition to the twenty-seven-day cycle, sun spot groups have an abundancy cycle from maximum, through minimum to maximum of about eleven years. The last maximum coincided with the outbreak of World War II in 1939. The sensational aurora of March 1, 1941, was followed by abnormally high terrestrial magnetic activity at forecast twenty-seven-day intervals, for the four immediately succeeding rotations of the sun.

Astronomers have observed, and radio circuit observations confirm, that the birth of a sun spot group may be preceded by a sudden eruption of the lighter solar gases, such as hydrogen. The radio term for such a solar eruption is "flare." Flares produce sudden brief interruptions on short wave circuits. After formation of the sun spot group, a longer and more persistent set of disturbances may occur. The *flare* is effective, whatever its relative position on the solar disc, in producing a disturbance on the light side of the earth. On the other hand, sun *spot* disturbance occurs only when the spot group is near the center of the sun's disc, which, of course, is the point closest to the earth.

Flare type disturbances, in view of the above, are found to have no regularity of occurrence. Sun spot

AN ARC OF PROMINENCES ON THE SUN IS PHOTOGRAPHED AT YERKES OBSERVATORY. THE WHITE DOT IN THE UPPER RIGHT HAND CORNER REPRESENTS THE COMPARATIVE SIZE OF THE EARTH.



groups, having a short-lived, but fixed, solar location, are synchronized with the rotation of the sun. These two distinct and separate types of short wave interruptions are well known to radio traffic men as "drop-outs," and "magnetic blankets."

When short wave radio signals transmitted from the earth's surface encounter the under side of the ionosphere, the peculiarities of penetration, reflection and absorption are again in evidence. The wave suffers repulsion and bending when it enters the ionosphere. The bending reaches a maximum for the low frequency long waves. It becomes progressively less to the point of penetration as the wave length shortens. Microwaves (extremely short) consequently are useless for direct long distance communication, since they are not turned back by the "radio ceiling."

In crossing the Atlantic, a short wave signal is bounced between the radio ceiling and the sea. The number of hops required varies with the distance between terminals, with wave length and with radio ceiling height. The signal strength varies with the turbulence of the ceiling and its absorbing properties. Solar radiations account for nearly all these variations, which simultaneously are reflected in terrestrial magnetic activity.

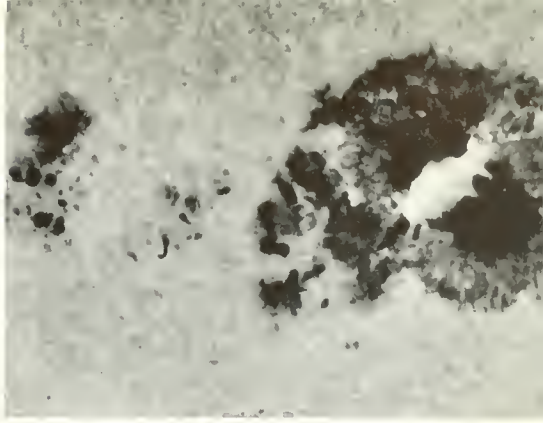
A flow of ions, whether in a wire, or in the thin upper atmosphere, is an electric current. The upper atmospheric currents produce measurable effects in the earth's magnetism. These effects are concentrated at the magnetic poles. Magnetic reactions between the agitated magnetic poles and the upper atmospheric currents cause the radio ceiling to be more turbulent, hence less useful as a reflecting medium over the poles than in lower latitudes. During a magnetic storm, a signal path over the magnetic pole may be opaque for radio communication. The blanketing effect increases as the circuit path approaches the magnetic pole. It has consequently been considered sound practice not to lay out a circuit path closer than 30° to the magnetic pole.

The magnetic storm is accompanied by an after-effect, which likewise is more pronounced and of longer duration near the poles. The lower latitudes, on the other hand, are affected only by the most severe of storms, and for relatively short periods. The after-effect within 30° of the magnetic pole may last four or five days. It may be more difficult to get a signal through, at a high latitude, three days after a storm has passed than at low latitude during the height of the storm.

Considerable study and research has been applied to the causes of "drop-outs" by many organizations. Noteworthy contributions have been made by Dr. J. H. Dellinger of the National Bureau of Standards, by the Carnegie Institution of Washington, which has sponsored annual conferences for ionospheric study, and by Communications Research, RCA Laboratories. The generally accepted theory is that the solar flare sets up radiations that pierce the normal layers of the earth's ceiling. These penetrations establish temporary absorption regions in the normal path of the radio wave. The temporary absorption may produce a complete, or partial, drop-out depending upon the violence of the solar eruption. When the flare subsides, the absorbing screen dissipates, and normal conditions return. The entire drop-out may last from two to thirty minutes, seldom longer.

Agreement is not so general upon the "magnetic blanket" type of disturbance. It is probable that a similar process is involved, over a longer time, in which the source is the slower radiation from a sun spot group passing the center of the sun's disc. The longer interval would permit the above noted reactions from the earth's magnetic poles.

Fading was one of the first observed characteristics of short wave signals. The range varied from a slow drift to the extremely rapid type called "flutter fading." As far back as 1925, a relationship was noted between fading and terrestrial magnetism. Poor circuit conditions soon became synonomous with "magnetics." At this early date, the radio ceiling was just beginning to be explored and studied. There soon followed the development of radio echo technique, permitting heights of distinct ionized



A PHOTOGRAPH OF THE GREAT SUN SPOT OF JULY, 1905, TAKEN FROM THE YERKES OBSERVATORY AT WILLIAM BAY, WISCONSIN.

layers to be measured. The occurrence of a sun spot maximum in 1928 further interrelated fading, circuit interruptions and terrestrial magnetism. The tools were evidently available for a considerable degree of success in "radio weather" forecasting. Magnetics could not be fully understood, however, until an extended correlation could be undertaken on typical radio circuits all over the earth.

Through the ageney of the Research Department of RCA Communications Inc., this study was undertaken on its world wide commercial radiotelegraph circuits. It involved the development of a measuring unit for magnetic variability, as well as long period signal recordings on many great circle paths. A circuit disturbance rating number system supplemented signal recordings to make the project more general.

The investigation indicated that, on a given circuit, a decrease in the signal was proportional to an increase in magnetic variability. It also became evident that general radio circuit conditions could be monitored by a magnetic observatory located near the mid-point of the circuit. The mid-points of trans-Atlantic circuits lie in mid-ocean. The practical compromise was therefore selection of an observatory nearest the terminals of the most disturbed high latitude circuits. The U. S. Coast & Geodetic Survey Magnetic Observatory at Cheltenham, Maryland was the selection. Daily "magnetograms" from Cheltenham are analyzed, and

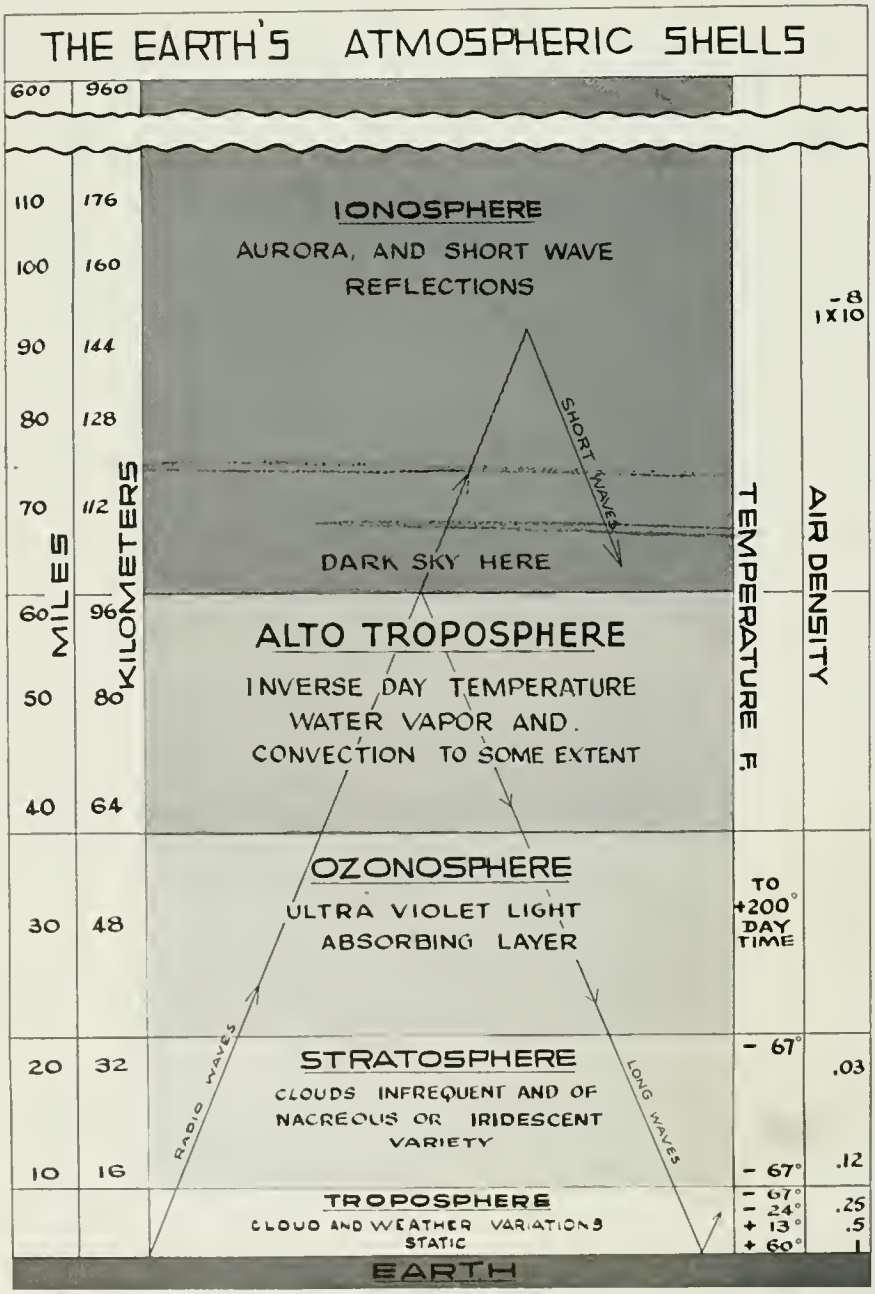
charted in sequence of solar rotations of twenty-seven days.

Cheltenham Magnetic Activity charts show peaks solidly filled in above the magnetic range level corresponding to a circuit disturbance. A glance at the chart reveals whether peaks are increasing or decreasing, and the manner of their grouping and recurrence. Consequently, it is possible to estimate what the probable "radio weather" will be for twenty-seven days following the conclusion of the plotting of the last analyzed magnetic sequence.

A North Atlantic Circuit Disturbance Rating chart, obtained from R.C.A. Communications, Inc., traffic operating reports, supplements the Cheltenham Magnetic Activity chart. There is thus provided a comparison of magnetic activity with circuit disturbance. The similarity of the charts is quite apparent when consideration is given to the after-effect on the North Atlantic circuits.

Eventually, it was desirable to have an immediately available reference source for radio weather. This was provided at the RCA Communications Research Department Receiving Section, at Riverhead, L. I., N. Y. It consists of a six-mile-long long wave receiving antenna, abandoned when short waves supplanted long waves for South American communications. This loop is grounded at both ends. The currents circulated by magnetic disturbances are continuously registered on an earth current recorder. These "earthograms" provide a direct source of information on radio conditions.

These methods, briefly described, are the ones adopted by Communications Research, RCA Laboratories to follow and to forecast radio weather. They provide a clue to the logic which the engineer could apply when he answered the query: "What are radio conditions going to be between now and the end of the month?"




## New Public Service Goal

Attainment during the coming year of public service programs of still greater quality was the goal set for the NBC Public Service Department by Niles Trammell, president, on September 15 at the conclusion of a two-day department meeting. Dr. James Rowland Angell, public service counsellor, presided.

Trammell expressed satisfaction with developments in the public service picture since the establishment of a separate public service department nine months ago, but added that he expected further progress in the future.

Frank E. Mullen, vice-president and general manager, declared that the department, in the short period of its existence, had succeeded in integrating itself with the complicated network setup and that public service programming had profited as a result.

# PERSONNEL AIMS OUTLINED

*Sarnoff Appoints Committee, Representative of All RCA Divisions, to Work Out Expanded Program of Employee Relations—Kirkpatrick is Chairman.*

By Forrest H. Kirkpatrick
*Chairman,*
*RCA Committee on Personnel*

The recent appointment by David Sarnoff, president, of an inter-company committee on personnel gives added evidence of the interest of Radio Corporation of America in the development and best utilization of men and women who make up the whole RCA Family. The membership of the committee includes personnel representatives from every unit of the Corporation. It is certain that the scope and influence of the Committee's work will be watched with great interest.

In the metamorphosis of business development, personnel management is emerging as a major business responsibility rather than as a necessary evil. In many companies, the beginnings of personnel management were none too fortunate. Sometimes, nondescript crews of uplifters and trouble shooters were put into personnel posts. Occupying about the same status as chief clerks, they kept employment records, interviewed job applicants, distributed Christmas baskets, operated cafeterias and athletic associations. That no personnel man had the authority to represent management except at the annual company picnic was well known to every employee.

There are signs on every hand, however, to indicate that business and industrial management has a broader, more intelligent, and more helpful understanding of personnel management than ever before. The appointment of the RCA Committee on Personnel has considerable significance in our own company. It is recognized by Mr. Sarnoff that we may be moving into a new social era, the structure and function of which are only faintly perceivable. It would seem to be a period when "human resources" are counted at a much higher value in the business and industrial life of this country. This period may mark the end of the "welfare and paternalism" concept of personnel work; it may lift the worker to a new sphere of importance; it may call for new techniques and channels for collaboration between management and labor; and it may ultimately find the means to free men from dissatisfaction in work and the fears that come with lack of work.

### *Problems Outlined*

Customarily we think of certain human problems as being representative of personnel functions with which this committee should be concerned, viz.:

(1) There are problems of employment and induction: how to select the right people and how to place them in the right jobs.

(2) There are problems of training: how to instruct new workers in the techniques of their jobs and in their responsibilities.

(3) There are problems relating to working conditions, safety and health: reasonable hours, and congenial conditions at work.

(4) There are problems relating to promotions: how to advance in accordance with their abilities and accomplishments.

(5) There are problems relating to payment: how to pay workers appropriately for the work they do.

(6) There are problems relating to the total welfare of employees: how to help them in times of need, as well as to provide recreational and social activities during their period of employment.

(7) There are problems of collective planning and bargaining: that is how to give employees the opportunity of saying and doing something with regard to the conditions of their employment.

The Committee on Personnel recognizes that personnel management, at its best, is not a technique or a department, but rather it is a leaven of confidence, fair play, and honest dealings which permeates all phases of business operation with the chief responsibility resting upon persons in supervisory or management positions. A personnel department can only be a "service bureau" to a program of personnel management and to the enterprise as a whole. Genuine personnel relationships must remain decentralized if maximum satisfactions are to be realized. The personnel department, therefore, should be a centralized agency dedicated to the aid and direction of all other departments in personnel matters.

As the work of the committee is undertaken, all members of the RCA Family should be aware of certain bases which undergird their thinking and planning, viz.:

(1) Serious study of practices, policies, and trends in the field of personnel management will make clear that there are many forces at work and many problems to solve. These are of varying value and import. None can be disassociated from the total scene or from the climate of opinion in which the industrial enterprise lives and moves and has its being. This climate of opinion is created by the attitude of management, workers, organized labor unions, and of the general public. It is shifted and changed by government controls and by the necessities of a war economy.

(2) RCA is definitely interested in healthy, intelligent, and honest personnel management. This means that the tasks to which this committee is committed are recognized as important and significant. It also means that the company is interested in every step that can be taken to develop better men and better women, to improve personal relations between the company and each employee, and to increase job satisfaction in all departments and at all levels.

(3) Healthy, intelligent, and honest personnel management does not come from wishful think-

ing or pious preachments. It will develop only as we have men and women in personnel management who are professionally alert, sensitive to human values, and constructive builders of a healthy RCA spirit.

(4) Healthy, intelligent, and honest personnel management cannot be delegated to a department or accumulated around techniques and devices. It becomes the responsibility of all management and all supervisors. It is important to remember that the man who supervises the most inconspicuous worker represents the Radio Corporation of America to that man, hence he represents good personnel management or bad personnel management on behalf of the company.

(5) In personnel management as in the conduct of our total business, decisions are seldom difficult if the basic facts can be developed. Where decisions are made which vitally affect individuals, our concern should be to see that such decisions are based on facts rather than on guesses, on a consistent, well-thought out policy, on fairness and reasonableness rather than prejudice and arbitrary action.

(6) The extraordinary personnel problems that come as a result of war economy represent a special challenge for our abilities and experience. They represent not only a challenge but an opportunity. The opportunity is to render a service to our country and to the things we believe in most—at a time when such service is badly needed and when such a contribution can be a great help.

Members of the new RCA Committee on Personnel as appointed by Mr. Sarnoff on July 30, are:

RCA Executive Offices, C. J. Finch, O. E. Dunlap, Jr.; RCA Victor Division, F. H. Kirkpatrick; RCA Laboratories, G. D. Nelson; R. C. A. Communications, Inc., J. F. Rigby; National Broadcasting Co., E. de la Ossa; Radiomarine and RCA Institutes, W. F. Aufenanger.

Mr. Kirkpatrick is chairman, and Mr. Dunlap is secretary.

# OCCUPIED NATIONS HEAR NBC

*Young French Aviator, Who Escaped Recently From Homeland, Tells of People Listening to Newscasts — Letters Praise Service.*

THE young French aviator found NBC's International Division in Radio City and told Herman Rogers, head of the French Section:

"I wanted to meet the voices I know so well."

"I was strolling along Sixth Avenue," the flyer explained, "and I happened to see the NBC marquee. I listened to NBC's French-language shortwave broadcasts every evening before my escape to England, and so does everyone else in my home neighborhood. I liked them so much that I got to know these 'voices,' and felt they were my friends.

"And you might be interested to know," he went on, "that among the 18 of us who escaped to England in a 25-foot fishing boat was an American flyer who parachuted from a Flying Fortress. We found him, sheltered him and hid him when the authorities came around. When we were ready for our escape, we took him along."

The aviator said he had escaped from France three months before, and was on his way to Florida—on this August day in 1943—to take an advanced naval aviation course which would enable him to instruct other French pilots.

The testimonial by this young Frenchman only served to add to the long body of proof that NBC's shortwave news broadcasts are picked up regularly by the peoples of the occupied countries.

A recent letter from Morocco says:

"So many thanks I owe you since June, 1940, for all the courage you have given us. . . . During that tragic month of June, every day, for hours at a time, I tried to listen to news . . . all the news available on the radio. It was my good fortune to discover some American stations, and, since then, I have been a faithful listener."

The writer explains she would have written her appreciation long before but it was only since the Allied liberation of North Africa that mail has been permitted to leave the country.

"You may not be aware how much your words mean to us, to all those who have known defeat, to all those who fell under the German heel! . . . I have always shared your point of view, whether it refers to a purely French situation, or to a world situation. . . . You may be sure that all your messages . . . are deeply felt by all 'true Frenchmen'. . . . So many others would cry out to you their hope, if they only could."

The letter is signed: "Madame H. Belnoue."

NBC shortwaves news, under Government auspices, not only in French, but in eight other languages as well. Daily broadcasts in German, Italian, Turkish, Danish, Swedish, and English are beamed to Europe and Africa, while a regular series of programs is beamed in Spanish and Portuguese to our neighbors in Latin America.

News broadcasts comprise only a part of the schedule. Many of NBC's regular network programs are shortwaved. The English section alone has a five-and-a-quarter hour schedule daily, directed primarily to the men of the armed forces of the United Nations.

The other language sections also have received word that their programs are being heard.

Niels Bonnesen, whose Danish broadcasts are heard in Denmark every day at 6:15 and 9:15 p.m., has been informed that that country's underground newspaper, which is said to have 120,000 readers, gives the time of NBC's broadcasts, and adds: "We recommend listening to NBC."

Bonnesen also has been told that King Christian of Denmark receives a mimeographed copy of all broadcasts each day.

Einar Thulin, of NBC's Swedish Section, received several postcards recently, commenting on his programs. The broadcasts are heard clearly in most parts of Sweden.




A STRIKING LOBBY DISPLAY SET UP BY STATION KWBW, HUTCHINSON, KANSAS, TO ANNOUNCE THE 1943-1944 NBC PARADE OF STARS.

# NBC BUILDS ITS AUDIENCE

*Network's Parade of Stars Is Designed to Create Greater Listener Interest In the New Season's Schedule of Radio Programs from Coast to Coast.*



By Jean E. Harstone

*Assistant to the Manager of Network Promotion, National Broadcasting Company*

"STARFACE," NBC's ambassador of goodwill and top service to its stations and clients, has led the 1943-44 NBC Parade of Stars off to a rousing start. For the past month all the NBC stations have concentrated their efforts on this elaborate promotion campaign.

Behind the story of the compilation of this promotion and its purpose, is the foundation and structure of the principles upon which the National Broadcasting Company was founded—principles which still guide its operations today—service through teamwork.

In 1926, when the National Broadcasting Company was incorporated, definite policies were set up. First of all, NBC visualized radio as in instrument of service—

A service to the owner of the local affiliated station from the National Broadcasting Company by providing programs, both commercial and sustaining, of a quality which the National Broadcasting Company was in a position to offer because of its vast facilities and more accessible talent.

A service to advertisers by furnishing them a large circulation over a vast territory—an audience to whom they could talk directly.

A service to the public by bringing to them in their homes a world of new ideas and enjoyment, a wealth of music and information through the medium of programs—the best of their kind, sufficiently diversified to appeal to all possible listeners.

Nor was this new instrument of communication to be a monopoly of the air. On the contrary, all-comers, competitive or otherwise, were welcomed; for the founders of the National Broadcasting Company envisaged radio as an instrument of freedom in the service of the people of all sects and nationalities. And in the organization itself, the services and work were to be unified by cooperation. This policy established then is maintained today. It is exemplified by the inter-organization motto—"You are the NBC and the NBC is you."

It is due to the basic idea—service through teamwork—that the NBC Parade of Stars is the great promotion it is—a radio-star-client-station - program - promotion with each participating group working in complete cooperation for one purpose and to one end.

The purpose of the Parade of Stars is simple and direct—to tell the public about the NBC network shows they will hear over their local stations during the coming season, thus creating interest in network programs. This teamwork benefits the listeners who look forward eagerly for their season's enjoyment through their NBC local station network shows. It benefits the sponsors and the stations, too, by building audiences and strengthening the position of the affiliated stations in the communities they serve.

The promotional material of the campaign included recordings, which the clients, their stars and agencies cut for their shows, and the publicity material prepared by the National Broadcasting Company to publicize the recordings and the shows. The publicity material consisted of speeches, scripts, announcement, newspaper and program mats and ads, posters and bus cards, photographs and mats of stars and a catalogue of promotion ideas.

All this material was coordinated into a unified promotion presented in deluxe portfolios and record albums, and sent to each station where it is being synchronized into their own promotion plans and presented to the listeners of NBC network programs in every State in the Union.




"STARFACE," NBC'S AMBASSADOR OF GOOD WILL AND SERVICE, WHO IS MARCHING THROUGH THE COUNTRY AS DRUM MAJOR OF THE PARADE OF STARS.

The first Parade of Stars, sent to the stations in September, 1942, was such a resounding success, with the stations exploiting every feature of the promotion, that the preparation of a 1943-44 Parade was a foregone conclusion.

After the results of the 1942 promotion were tabulated, these amazing figures were revealed:

7,566 actual broadcasts of the Parade of Stars recordings were made.

315 hours of programs, equivalent to 20 full days of radio shows.

5,603 newspaper ads and press announcements were placed by the stations.

1,377 lobby displays were used as well as 1,783 car, window and bus cards.

Many stations linked their promotions with local celebrations such as Fall Fairs, and took every opportunity to make the public aware of the great NBC shows that would bring them their favorite stars and programs throughout the season.

This year, with the experience of the first promotion behind it, and with many valuable suggestions from the stations themselves, the National Broadcasting Company expanded the scope of the Parade of Stars. Instead of functioning as a Fall promotion, publicizing the return of the network shows to the air after the Summer, the 1943-44 Parade of Stars was designed to promote NBC network shows *throughout the year.*

The scope was broadened in many directions. Instead of twenty shows — as in the 1942 Parade — this year's Parade presented forty-five sponsored shows and five NBC Public Service programs, fifty in all, with twenty-seven clients and twenty-eight agencies giving splendid cooperation. The format of the promotion was more streamlined. All the promotional material was included in compact and attractive portfolios beautifully printed in red and purple on a pastelle gray background. The record albums which carried the recordings, were designed to provide the stations with a permanent case for their Parade of Stars transcriptions. Incorporated in the back of each album are pads of "Recording Use Sheets" for a record of the stations' use of their Parade of Stars transcriptions. The entire promotion was distinguished by a special recognizable symbol "Starface," the smiling major domo, who is carrying it so successfully throughout the country.

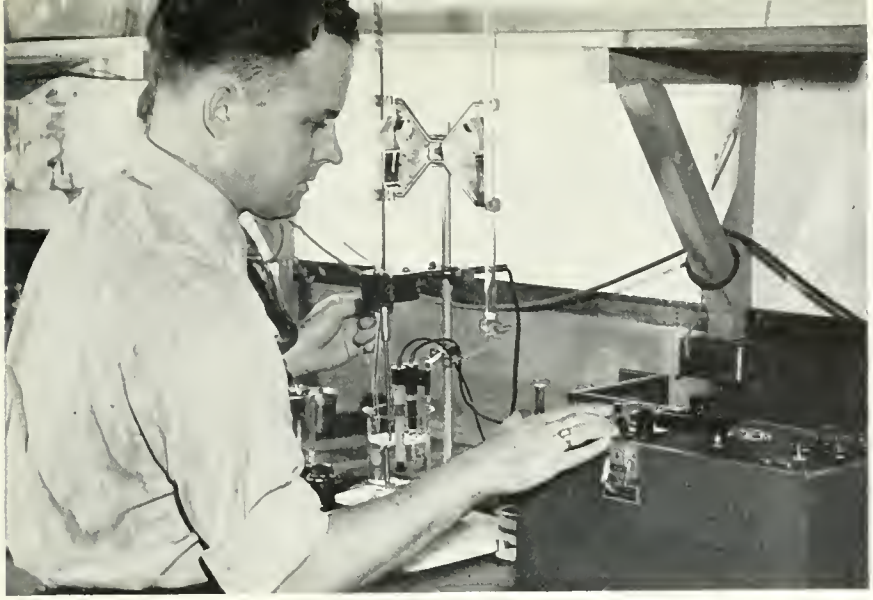
In addition, the National Broadcasting Company has prepared an extensive newspaper promotion for its owned and operated stations in New York, Chicago, Cleveland, Washington, Denver and San Francisco. This newspaper campaign, backing the Parade of Stars promotion, consists of full page opening ads, followed by a series of 600 line ads featuring the daily program schedules.

At the time of writing "Starface" has been in circulation two weeks with the Parade of Stars. It is therefore too early to give a complete picture of the results of the promotion. But from the scores of station letters that have come to NBC telling of station promotion plans and from the re-orders of promotional material during the past two weeks, the National Broadcasting Company has every reason to believe that "Starface" and the NBC Parade of Stars are making a hit all over the country.

The creation and the organization of the NBC Parade of Stars was a prodigious task. The work could not have been accomplished in its present comprehensive form without the wholehearted cooperation of all who participated in its production — performers, advertisers, agencies, associated stations and the National Broadcasting Company. All gave their best efforts to the project as a united team. It is NBC promotions such as the Parade of Stars, designed to service its clients, their agencies and NBC network stations, that have helped maintain for the National Broadcasting Company since its inception, its leadership as the No. 1 network.

PROMOTIONAL HELPS ARE INSERTED IN THE NBC 1943-1944 PARADE OF STARS PORTFOLIOS.





DR. O. D. BLACK OF RCA VICTOR USES AN ELECTRONIC DEVICE TO TEST THE ACIDITY OF A MATERIAL DEVELOPED TO MODIFY PETROLEUM ASPHALT FOR USE IN POTTING TRANSFORMERS.

# CHEMISTRY AIDS WAR WORK

*Chemical Engineers at RCA Victor Apply Science In Producing Best In Radio-Electronic Equipment for Armed Forces—War Brings New Problems.*



**By Clifford Eddison**

*Manager,*
*Chemical Engineering Section,*
*RCA Victor Division*

MINERAL oil from the drugstore shelf, common starch from the household laundry, a pigment developed for the paint industry, and many other substances have been commandeered by RCA Victor Division chemical engineers to produce the best and most dependable radio and electronic equipment for our armed forces.

The war brought to our organization, as to other industries throughout the country, new and more rigid specifications for completed products, more critical inspection standards, and, almost simultaneously, materials shortages necessitating the use of new and often relatively unknown materials. Resulting materials and process problems have been numerous, but in applied science we have found the answers.

As a result, RCA radio coils for military and naval use are now protected against moisture with a substance that merrily thumbs its nose at the torrid temperatures of North African deserts and South Pacific island jungles, and just as merrily defies the frigid cold of Iceland and the snow-blanketed Aleutians.

By the same token, bomber and fighter crews carrying RCA aircraft radio equipment are relieved of excess weight without sacrifice of strength and serviceability, and men whose lives and whose victories for us depend on the accurate performance of devices kept "on the beam" by quartz crystals are assured of mass production of these crystals without loss of their essential accuracy.

Similarly, a new compound for the potting of RCA transformers for the armed forces has been developed in order to meet the more severe conditions of operation, and various items in which efficiency depends on the soldering of steel parts are made available through the discovery and use of a new fluxing agent which is sufficiently active for such soldering but free of corrosive tendencies.

Mineral oil was pressed into service by the Chemical Engineering Section when it was found that the wax ordinarily used to impregnate radio coils would flow when too hot and crack or crystallize when too cold, all within the extremes of temperature at which these coils would be required to function. Either failure would expose the wires to moisture, adversely affecting the electrical properties of the coils.

The problem was solved with the development of a new impregnating agent, made from mineral oil and cumar resin, which will withstand both extremes of temperature without loss of its protective characteristics.

But a tougher problem was posed by our need for a means of soldering aluminum to permit the use of this light-weight metal in products where weight is an important factor, such as chassis for aircraft radio equipment.

Since aluminum cannot be directly soldered in a commercially



DR. C. W. MELL EXAMINING AN ALUMINUM PANEL PLATED BY A METHOD DEVELOPED BY THE CHEMICAL ENGINEERS TO PROVIDE A SOLDERABLE SURFACE.

convenient manner by any known method, a means was sought for plating the aluminum with another metal, to provide an easily solderable surface and, at the same time, a better means of assuring good electrical contact. But neither can aluminum be directly plated, so an indirect approach was necessary.

After some study, our laboratory found a conducting material which could be applied to aluminum as film by means other than plating, and developed a process for applying it and for subsequent plating of the aluminum thus treated.

Common starch came to the rescue as a fluxing agent for various soldering operations when we found that neither rosin nor zinc chloride, which are the agents most extensively used, would do the job in certain applications.

Fluxing agents are used to cleanse the surfaces to be soldered, and make the solder alloy with the base metal. Zinc chloride is a powerful flux, but tends to cause corrosion unless the soldered parts are washed to remove the excess flux after soldering. Rosin, though free of this fault, is not a very active flux, particularly when used with such metals as steel.

In certain types of equipment it was found necessary to solder steel parts together, but impossible to wash the parts after the operation. Our laboratory solved the problem with the discovery that levulinic acid, derived from common starch, was a much more active flux than common rosin. It was found that this acid, when blended with rosin, could be used in soldering steel parts without the necessity for subsequent washing.

Process as well as materials problems have yielded to applied science in our laboratory. The problem of how best to deposit silver on quartz crystals to form electrodes, for example, was one of the serious potential bottlenecks faced by our organization when the war made it necessary for us to convert to a mass production industry, almost overnight, what had been only a limited activity in the manufacture of crystals.

Although the Rochelle salts method appeared to be the most adaptable to mass production, the first results with this method were disappointing. The method had been applied largely in the past to satisfying optical requirements, and the technique of operation had been directed to that end. It was found that uniformity of film thickness, directly affecting electrical results, could not be guaranteed, while the adhesion between silver and quartz was poor.

A process overcoming these difficulties and satisfying all requirements was developed, but not until after we had completed a study of the effect of solution concentrations, temperatures, times of immersion, rate of flow of solutions over the crystal face, and the role played by the compound, silver tartrate.

As has already been indicated, not all of our materials problems have resulted from shortages. New requirements, rendering materials formerly used unsatisfactory, have played their part. This was true in the case of petroleum asphalt as a substance for impregnating and potting transformers.

Although petroleum asphalt remained plentiful, it did not inherently possess the properties required to meet more exacting test specifications as it became necessary for transformers to operate under more severe conditions. In this instance our laboratory found means of modifying the substance by blending it with other materials.

Our borrowings from the paint industry involve the use of a black oxide of iron, specifically developed as a pigment, as the essential material in the manufacture of cores used in controlling the effective permeability of magnetic circuits.

Such satisfactory solutions of materials and process problems as those enumerated have been possible at RCA Victor because of the fact that our organization, with its background of experience in the various kinds and applications of engineering and science, was from the beginning in a relatively fortunate position to meet the challenge of wartime requirements.

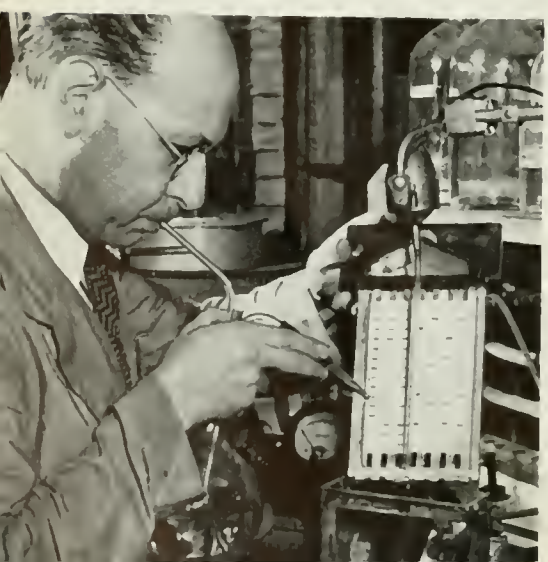
Some manufacturers were not so well prepared. Actually, wartime manufacturing conditions have, in some instances, only emphasized fundamental weaknesses that were present in pre-war days, increasing costs and constituting a self-imposed break on maximum progress.

However, as more and more rigid specifications have been introduced and the number of new or substitute materials increased, even manufacturers lacking previous experience in the scientific solution of such problems have begun to seek out the special training and experience most applicable to help them meet their emergencies.

To make the wisest use of the chemical sciences, it is essential to know the scope and purpose of the various specialized branches. Gone are the days when the individual chemist might be expected to give an authoritative opinion on such widely different subjects as metals and alloys, dyes, plastics, and textiles. Partly because of the ever-expanding horizon of the chemical sciences, and partly because of the number and complexity of raw materials and process requirements entering modern manufacturing industries, it has been almost imperative for the individual chemist to undertake some specialty.

While it may rarely be either advisable or necessary to utilize all the branches of the chemical sciences in a specified industry, the bringing together of the needed specializations to form a strong, well-organized unit dedicated to the scientific solution of materials and process problems can do much to reduce costs and to keep products ahead of the field.

DR. LEOPOLD PESSEL SPRAYING A WASH ON QUARTZ CRYSTALS TO REMOVE EXCESS SILVER SOLUTION. SILVER IS DEPOSITED ON THE CRYSTALS TO FORM ELECTRODES.






EMPLOYEES OF THE RCA VICTOR PLANT IN CAMDEN, N. J., RAISE THEIR NEWLY AWARDED ARMY-NAVY "E" FLAG WITH THREE STARS FOR CONTINUED EXCELLENCE OF WAR PRODUCTION.

# PRODUCTION WINS 3 AWARDS

*RCA Victor Plants In Camden and Indianapolis and Radiomarine All Get Government Honors for Outstanding War Production.*

THE efficiency of RCA workers on the war production front has again received official recognition. On August 17, the Camden plant of the RCA Victor Division won a third star for its Army-Navy "E" Flag and on September 7, Radiomarine Corporation of America added a star to its Maritime "M" Pennant. Moreover, the Indianapolis plant of RCA Victor has been notified that it will be awarded the Army-Navy "E" Flag in the near future.

Including the Indianapolis award, RCA organizations have now won five Army-Navy "E" Flags with a total of five stars, a Maritime "M" Pennant with one star, and a Victory Fleet Flag.

The Camden plant of RCA-Victor began the flag-winning parade in January, 1942, when it became the first RCA unit privileged to fly the Army-Navy "E" Flag. Since that time it has won three stars for its flag, each star representing six months of continued production efficiency. In awarding the third star on August 17, Admiral C. C. Bloch of the Navy Board for Procurement Awards said in part:

> The men and women of RCA Victor have achieved a signal honor by continuing their splendid production in such volume as to justify this renewal of their award. In the first instance, it was difficult to win the Army-Navy "E", and by meriting a renewal the management and employees have indicated their solid determination and ability to support our fighting forces by supplying the equipment which is necessary for ultimate victory.

Workers at the Harrison plant of RCA Victor won the Army-Navy "E" Flag in September, 1942. A star was added to the Harrison flag in April, 1943, when Under-Secretary of War Robert P. Patterson declared that it was "the symbol of appreciation from our armed forces for your continued and determined effort and patriotism."

Radiomarine Corporation of America was awarded the Army-Navy "E" Flag in December, 1942, and a star for continued production was added in March, 1943. Radiomarine also holds the Victory Fleet Flag and the coveted United States Maritime Commission "M" Pennant to which a star was affixed on September 7. Both these flags were awarded in March, 1943. In presenting the flags, Admiral H. L. Vickery, Vice Chairman of the United States Maritime Commission praised Radiomarine employees for on-time delivery of vast amounts of radio equipment for the Merchant Marine despite innumerable difficulties in procurement of materials.

The fourth Army-Navy "E" Flag won by the RCA organization was awarded to RCA Laboratories in June, 1943. Rear Admiral Harold G. Bowen, who spoke to the research workers for the Navy, said:

> You who have been in the middle of things like I have, appreciate the enormous amount of technological development successfully completed before actual combat took place. You who participated in this effort made great contributions to win the war long before the war started. To you we are indebted for our present technological excellence. But not content with what you accomplished before the war, you are still contributing to the war with conspicuous success.

The announcement that the RCA Victor Division plant in Indianapolis was soon to be the fifth RCA winner of the Army-Navy "E" Flag was greeted with a spontaneous display of employee enthusiasm throughout the factory when the letter from Undersecretary of the Navy James N. Forrestal was read over the plant-wide broadcasting system by C. N. Reifsteck, plant manager.

Buy War Bonds



DON AMECHE AND JEANNETTE MAC DONALD GIVE THEIR AUTOGRAPHS TO MEMBERS OF THE STUDIO AUDIENCE AFTER A "WHAT'S NEW?" BROADCAST.

# "WHAT'S NEW?" IS RADIO HIT

*Critics Praise RCA's New One-Hour Saturday Night Program—Sarnoff Keynotes Series During Opening Broadcast On Blue Network.*

RCA's big show is on! "What's New?" is on the air. The big tent is, in effect, the entire nation, and every one of the 159 stations of the Blue Network offers a free pass. The show lasts one hour and can be heard every Saturday at 7 p.m., EWT. The theme of the performance is what's new in the world at large—in entertainment, music, news, personalities, sports, science, and politics.

Ringmaster of "What's New?" is Don Ameche, versatile star of screen and radio, who qualifies for his key role as Master of Ceremonies by a natural flair for showmanship coupled with marked ability as an entertainer. He is ably seconded by the RCA Victor Orchestra and Chorus and a host of guest stars drawn from the entire world of entertainment.

At the Hollywood premier of "What's New?" on September 4, a big variety program offered entertainment to please every taste.

Music, of course, played a prominent role in the program. The main musical surprise of the evening was furnished by the great concert pianist, Jose Iturbi. That Iturbi should play De Falla's "Fire Dance" superbly was no surprise. But that he should also play "The Joint Is Really Jumpin'" in boogie-woogie startled lovers of classical music as much as it delighted "hepcats." Fresh and sparkling tunes were sung by Cass Daley, bright new commedienne, and Dinah Shore, one of the "great ladies" of popular song.

Anne Baxter, screen star of "Five Graves to Cairo," teamed with Don Ameche in a humorous one-act play of modern marriage entitled, "You Can't Stay Mad." Cass Daley also joined Don Ameche in a comical skit and Ed Gardner, whose spectacular rise in 1943 makes him the newest of major radio comedians, played his famous role of "Archie" of Duffy's Tavern.

A patriotic note was struck when a switchback from Hollywood to New York brought Jim Ameche, Don's brother, to the microphone to introduce Lucy Monroe, director of patriotic music for RCA. Miss Monroe described how she teaches workers and management in war plants to sing together for relaxation and inspiration.

David Sarnoff, president of the Radio Corporation of America, keynoted the opening program when he spoke for the men and women of RCA.

"*Our* search for things new," said Mr. Sarnoff, "is primarily in the field of radio and electronics. This work has produced the present day marvels of communications, of broadcasting, and television through the air. It has revolutionized methods of warfare, and created new industries of peace. But the promise for the future, is even greater than the past.

"While an electron is the smallest thing in the world, we can control its behavior, and put it to work. When we do so, we call it electronics. And the heart of electronics is the radio tube. The tubes in a sending set enable you to speak by radio, and the tubes in a receiving set, enable you to hear. We constantly find new uses for electronic tubes. They can see, smell, and feel. On land, at sea and in the air, they guide friendly vehicles to their destination, and locate unfriendly objects more accurately than the enemy likes.

"Out of our search for the new, has come the electron microscope—developed by RCA Laboratories. This instrument magnifies by 100,000 diameters. As an illustration of what this order of magnification means, I might tell you that if the average football field were enlarged by 100,000 diameters, it would be five times as large as all of the United States. Only with a microscope of this power, can we



DAVID SARNOFF, JOHN U. REBER AND DON AMECHE AT A REHEARSAL FOR THE FIRST "WHAT'S NEW?" PROGRAM.





PERFORMERS AT THE "WHAT'S NEW?" PREMIERE INCLUDED (LEFT), LOU BRING, ANNE BAXTER, CASS DALEY, JOSE ITURBI, ED GARDNER, DINAH SHORE, AND DON AMECHE. THE RCA VICTOR CHORUS (ABOVE) CONTRIBUTES SKILLFULLY TO THE MUSICAL PORTION OF EVERY "WHAT'S NEW?" BROADCAST.

see many important things, otherwise entirely invisible. For example, the influenza virus, at last can be seen. This should help to find a way to conquer it, and thus to benefit mankind.

"This microscope is only one of a thousand electronic wonders that can open a new world for all of us. Within the limits necessarily imposed by the requirements of military secrecy, we plan to tell you about them from week to week, on this program."

Typical of press and public reaction to the first performance of "What's New?" was the comment of *The New York Times*.

" 'What's New?' is a good show. . . . There are music, drama, comedy and some serious talk, and, all in all, it is an omnibus on which every passenger should find something to please him. . . ."

Variety, trade paper of screen, radio, music, and stage, said:

". . . The Blue Network becomes the beneficiary of an hour of upper-crust popular entertainment. . . . That opening program seemed to have the answers to what constitutes mass appeal entertainment. The ingredients were consistently know-how, the runoff was oily-smooth, and the commercials were astutely tied in. . . ."

The second performance of "What's New?", like the first, brought an impressive guest list of new or well-known voices to the microphone. Headlined were Captain Clark Gable who spoke via short-wave from "somewhere in England"; Lena Horne who sang the title song from her latest film-musicale, "Stormy Weather"; the popular comedy team of Wally Brown and Alan Carney; Monty Woolley whose newest movie venture is "Holy Matrimony"; and Katrina Paxinou, the Greek actress who made her American screen debut as Pilar in "For Whom the Bell Tolls."

Major Alexander de Seversky, one of the greatest aeronautical engineers of all time and author of "Victory Through Air Power" prophesied a new era of international peace for the post-war world.

"There is a lot of discussion these days about the post-war relations between the countries of this planet," he said. "The plain fact is that science and technological progress will force the whole world to become, in effect, one neighborhood. People in any part of the world will be able to see each other through television, to hear each other through radio, regardless of distances. And space, when measured in the time of flight through the air, will be so contracted that any spot on the face of the globe can be reached in a few hours. The science of destruction is making war more and more horrible. Ultimately, we may be sure, war will become unthinkable because it would be tantamount to suicide."

Major de Seversky also foretold a tremendous post-war expansion of aviation made possible by the use of electronics. The airplane's universal use by average people he no longer considers an engineering question but rather a problem of effective communications.

"Electronics will ultimately make it possible for anyone to get into his private aircraft, turn a knob and *tune in* on his point of destination anywhere, and get there automatically and safely . . . aircraft will travel on invisible rails and highways of radio . . . or they will be able, at will, to abandon the chartered highways to soar through all space. The automobile turned *nations* into neighborhoods. Aviation and electronics will turn the *world* into a neighborhood. Life will be lifted into new dimensions, and will acquire new horizons."

The first two performances of "What's New?" set the pace for the new show and revealed that the program makers had aimed well in pointing to new horizons and glimpses of the future. For anything can happen on "What's New?". Next week's program may bring a dramatic eyewitness account of a battle between American and enemy forces, the announcement of an important new discovery in science, or a new love song destined to wing its way around the world.

# OWI USES RECORDING UNITS

*Studios of Overseas Operation Branches Equipped With RCA Recording Lathes for Preparing Radio News and Entertainment Programs.*

A TOUR of the headquarters of the Office of War Information in New York City reveals how America employs a weapon which the enemy dare not use—truth on the wings of radio. Day and night, twenty-four hours out of twenty-four, OWI bombards the enemy with the facts about the war.

The ammunition for this barrage is prepared in the engineering studios of the OWI Overseas Operation Branches in New York and San Francisco. In each of these studios are long lines of RCA recording lathes, the machines which ceaselessly cut into disk records the news and entertainment programs that are the backbone of OWI's overseas propaganda service. These OWI broadcasts are recorded as they are made. At the same time, OWI produces a large number of special programs specifically for record reproduction and transcribes many of America's most entertaining domestic programs.

This technique of multiple program reproduction by RCA recording lathes increases by many times the effectiveness of OWI broadcasts. The ability to rebroadcast a program repeatedly has become vitally important. For it is the aim of OWI to send America's message of freedom to the farthest corners of the earth, to reach their peoples in their own languages, and at an hour when these messages are most likely to be heard. All this, despite the fact that to the ordinary technical difficulties of world-wide broadcasting are added the artificial obstacles devised by a resourceful enemy.

In Axis-occupied territories, liberty to listen has long since disappeared. If Heinrich, Yamato, Halvor, and Jean are found listening to foreign broadcasts, the penalty may be imprisonment or death. Moreover, whenever possible, the enemy "jams" the "Voice of America" broadcasts to remove all such temptation.

It is explained by OWI representatives that even though time was not invented by the enemy, the time factor is another major obstacle that could cost the "Voice of America" many listeners. For instance, if President Roosevelt begins a "fireside chat" on a Monday night at 10 o'clock, a convenient hour for American listeners, it will be at the same moment 4 a.m. Tuesday in Berlin and Vienna, and 11 a.m. Tuesday in Manila and Shanghai, a most inconvenient time for listeners in those cities. Moreover, many important listeners are unable to plan their radio listening. An American soldier in New Guinea may have far more pressing business than to listen to a specific radio program at a specific hour.

OWI's answer to these problems is to rebroadcast important programs many times and to beam all programs at a time and in a direction where its prospective listeners have access to the radio. Records produced on the recording lathe make possible this procedure.

Italy's unconditional surrender on September 8, one of radio's biggest news assignments of all time, afforded a dramatic illustration of the value of this aerial task force of records to the OWI. When the first news of the great event was flashed from Algiers, OWI immediately began broadcasting bulletins. And when General Dwight D. Eisenhower spoke at 12:30 p.m., EWT, his words were instantly transcribed by the OWI recording lathes. In a matter of minutes, the General's announcement was translated into eighteen languages, recorded, and broadcast to all the world over twenty short-wave transmitters. In the first 24 hours after General Eisenhower spoke, his announcement was broadcast approximately 150 times. Europe, in particular, was bombarded with the good news, which was repeated continuously in Italian, French, German, and English.

Marshal Pietro Badoglio's proclamation of the surrender of the Italian armies which followed the announcement of General Eisenhower, was also rebroadcast many times. Specially prepared records were beamed to the people of Italy urging them to aid the Allied armies and to deny help to German soldiers.

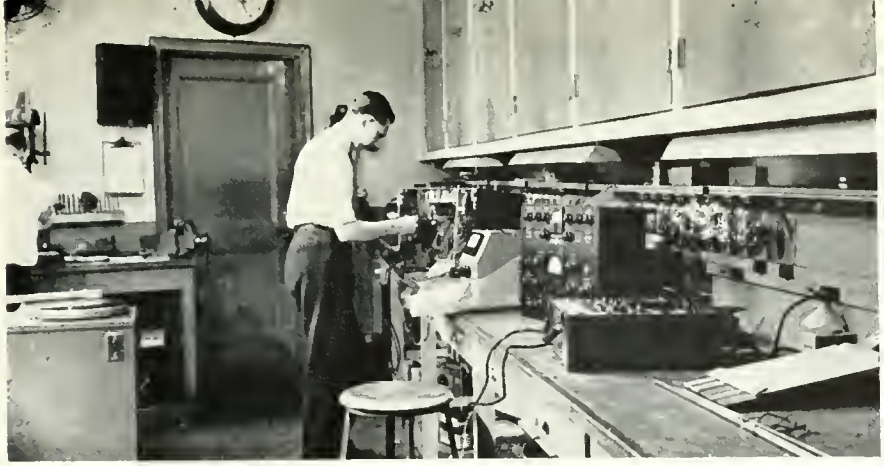
If Heinrich, Yamato, Halvor, and Jean turned on their radios at any

A SECTION OF THE RCA-BUILT RECORDING LATHE BANK AT OWI HEADQUARTERS IN NEW YORK CITY.



A RECORDING MASTER CONTROL DESK REGULATES THE OPERATION OF THE RCA RECORDING LATHES.







AN ENGINEER IN THE OWI REPAIR SHOP (ABOVE) MAKES A ROUTINE EQUIPMENT CHECK-UP. FROM THE RECORD ON THE RCA TURNTABLE (RIGHT) A MESSAGE IS BEING SENT BY SHORT WAVE TO EUROPE.

hour of the day or night during this critical period, they heard the important news as if they lived in the United States. American service men and women abroad also heard their commander's voice. Neutral countries received the news quickly, accurately, and with fortunate political results.

The RCA-built recording lathes in the OWI studios are by no means exclusively devoted to the preparation of news broadcasts. Every day and night, they record the best domestic radio programs for retransmission to our fighting men abroad. A Marine sergeant in the Solomons or a seaman on a destroyer in the Mediterranean can listen to the NBC Symphony Orchestra or to one of his favorite comedians at almost any hour he can get to a radio—even though many hours may have elapsed since the original programs were presented in New York or Hollywood.

In superficial appearance, the RCA recording lathe is not unlike the chassis of a Victrola manufactured for home use. But there the resemblance ends. For the recorder is designed not to play records, but to cut them, a much more complex task.

The heart of the machine is the cutter-head, which actually carves the grooves that record the sound. The cutter-head is designed so that groove adjustments can be easily made while the machine is in operation. Most important of all—the head must not be susceptible to shocks, rumbles, or vibrations, which distort the sound. The cutter-head which RCA Victor scientists designed for the OWI is so delicate that each of the fourteen in use in New York and the twelve in San Francisco had to be made by hand.

The carriage assembly, the main unit of the machine, is a standard RCA product. It is as remarkable in its own way as the cutting head. Complicated but precise mechanism, operating with two motors, makes it possible to record at either 33⅓ or 78 revolutions per minute. Records can be cut from the outside-in or the inside-out, at 96, 112, 120, 136, or 154 lines to the inch. Speed and groove adjustments can be simply and quickly made by turning a knob. There are no bothersome gears or belts to change or to get out of order.

Adjusting the depth of a record groove to produce the best sound results is a highly skilled art, requiring many months of practice. Each recorder is equipped with a high-powered microscope to make possible a minute study of the grooves. The microscope is mounted on an adjustable arm, which permits it to be moved to any part of the record. A small shielded lamp, mounted on the same arm, can be independently adjusted to illuminate the particular grooves under observation.

Since the slightest vibration would make perfect record reproduction impossible, the motor is shock-mounted in rubber. In addition, each of the OWI recorders is supported by 700 pounds of concrete, resting on rubber mats.

It is difficult for the casual visitor to the OWI recording studios to realize that the long rows of quiet machines are preparing verbal bombardments for overseas, or that the engineers operating the machines are actors in an international drama. Yet the results of this activity are as effective politically in America's prosecution of the war as are airplanes, battleships, or tanks on the military front.

## BLUE NETWORK SALE ANNOUNCED BY RCA

*Agreement to Sell Nation-wide System to Edward J. Noble for $8,000,000 Revealed by Sarnoff*

David Sarnoff, President of Radio Corporation of America, on July 30 announced that an agreement had been reached to sell the Blue Network for the sum of $8,000,000 in cash to Edward J. Noble, former Under-Secretary of Commerce.

This move came a year and a half after the Blue was organized as a separate coast-to-coast network, and in conformity with the new regulations of the F.C.C. relating to ownership of more than one network by any single organization. The Radio Corporation of America remains the owner of the National Broadcasting Company which will continue to operate the "Red" Network.



"THE BIG SPLASH" AS MRS. LENA RETTBERG (ABOVE), INSTRUCTRESS AT THE RCA VICTOR PLANT AT HARRISON, CHRISTENS THE S.S. ROSEBUD AT MOBILE, ALABAMA. MRS. RETTBERG STANDS WITH ROBERT YOUNG (RIGHT), CRYSTAL PROCESSOR IN THE CAMDEN PLANT, WHO CO-SPONSORED WITH HER THE NEW 21,600-TON TANKER.

# RCA WORKERS LAUNCH SHIP

*Suggestions for Speeding War Production, Conserving Man-power and Critical Materials Bring Special Honors to Contest Winners.*

PRESENTING a new way of stimulating and rewarding employees' suggestions for speeding war production, the RCA Victor Division completed early in September a five-day series of special events in honor of six RCA war workers.

The program was one of the most comprehensive yet developed in recognition of the contribution of workers to the war program, through suggestions for speeding production and conserving manpower and critical materials.

Packed into the five days were a variety of entertainment in three cities, official receptions by municipal authorities, presentation of the contest winners to top officials of their company, participation in several radio broadcasts including an international hookup, tours of home plant and headquarters offices of both the division and the corporation, and, capping the climax, participation in the launching of a big Victory ship at Mobile, Alabama.

Those honored were top place plant winners in suggestion contests sponsored by labor-management production drive committees in RCA plants at Camden and Harrison, N. J.; Lancaster, Pa.; and Indianapolis and Bloomington, Ind. Conducted through a two-weeks period under the slogan "Don't Miss the Boat," the contest resulted in 3,500 employee suggestions, a substantial percentage of which were found practicable, and adopted.

All workers whose suggestions were adopted received awards of war bonds and war savings stamps in varying amounts up to $350. The top winner for each plant received, in addition to these awards, a trip to Mobile to share honors in the launching. Visits to Camden, N. J., headquarters of the RCA Victor Division, and New York City, home of the Radio Corporation of America, were made enroute to Mobile.

Converging at Camden from their several plants, the honor group, including five men and one woman, were presented to Robert Shannon, general manager of the RCA Victor Division, feted at a luncheon, and conducted on a tour of the plant.

Continuing to New York that afternoon, they were quartered at the Governor Clinton Hotel, and received at City Hall by Newbold Morris, President of the City Council, who presented the top winners with a silk American flag. They made guest appearances on several radio programs and were entertained at a Manhattan night club. The following morning, they were presented to Lieut. Gen. James G. Harbord, chairman of the board of Radio Corporation of America; and then taken on a tour of Radio City.

Arriving at Mobile, the party of war workers were accorded an old-fashioned brass band station greeting. On hand were the Mayor of Mobile, officials of the Alabama Dry Dock & Shipbuilding Company, from whose ways the launching was scheduled, a band, and a turn-out of Mobile citizens. The local radio station, WMOB, broadcast a 15-minute on-the-spot program.

At night, the workers were guests at a traditional Mobile "shrimp dinner." The following morning, they were escorted on tours of the shipyards and various points of interest in the city.

The crowning event came Friday night at the shipyards, when Robert Young, of Philadelphia, crystal processor in the Camden plant and top winner for all plants, cut the rope that released the *S.S. Rosebud*, 21,600-ton tanker, and Mrs. Lena Rettberg, of Newark, instructress in the Harrison plant and only woman among the winners, smashed a bottle of champagne against the ship's prow as it slid down the ways into Mobile Bay.

Adding color and significance to the occasion, the launching was broadcast over the nation-wide Blue Network. On this radio program, RCA Victor workers joined with workers in Moscow, London, and Chungking in a salute to war workers of the United Nations.

Edwin C. Hill, world-famed news commentator, directed the radio program from New York, while Ben Grauer, noted announcer, described the launching and introduced the RCA Victor workers, from Mobile. Rear Admiral H. L. Vickery, vice chairman of the U. S. Maritime Commission, was cut in from Cleveland to pay tribute to the workers.

Robert Young, who is 26, won his honors, including a $350 war bond

prize, for his suggestion of a method of cutting quartz crystals which has increased the yield of usable crystals in his department by 50 per cent.

Mrs. Rettberg, an employee of the Harrison plant for thirteen years, received in addition to the Mobile trip the first $300 war bond prize to be won by a woman worker in the company's plants. Her suggestion was for simplification of an engineering problem in the making of radio tubes. The award was her fourth.

The other winners in the party were:

Ray C. Aument, of the Lancaster plant, whose suggestion of a new way of setting up a "basing" operation in the assembly of radio tubes has virtually doubled the output.

William A. Wilson, junior time study engineer in the Bloomington plant, whose idea of a "sliding anvil" saves 37 man hours per thousand units in the processing of parts of sound system terminal boards.

Delmar Taylor, matrix setter in the Indianapolis plant, who devised a time and material-saving operation in the making of matrices.

Charles Yanzer, spray man and co-winner with Taylor at the Indianapolis plant, who suggested a rack for use in spraying paint on the chest plates of field telephone apparatus, enabling the operator to spray eight units at once, instead of one at a time.

# RCA SETS AID SICILY FIGHT

*Equipment Enabled U. S. Destroyers to Lay Down Bombardment That Facilitated Invasion Landing, Employees Told by Rear Admiral Cochrane.*

RADIO messages flashed over RCA-built communications equipment enabled two American destroyers spearheading the Allied invasion of Sicily to lay down a shore bombardment that facilitated the landing of our troops with a minimum of casualties, Rear Admiral B. L. Cochrane, USN, Chief of the Bureau of Ships, revealed early in September in a message to the men and women of the RCA Victor Division, Radio Corporation of America.

Quoting from a combat report received in Washington from the two destroyers, which carried the RCA apparatus, Rear Admiral Cochrane described the part played by the units as "vital," and concluded his message by saying: "We need more of this fine equipment for invasions to come."

The full message follows:

"THE VITAL PART PLAYED BY RCA COMMUNICATIONS EQUIPMENT IN THE INVASION OF SICILY IS RELATED IN A COMBAT REPORT JUST RECEIVED FROM TWO DESTROYERS WHICH SPEARHEADED THAT OPERATION. SHORE BOMBARDMENT BY THESE SHIPS FACILITATED THE LANDING OF OUR TROOPS WITH A MINIMUM OF CASUALTIES. ON ONE OCCASION, INFORMATION RECEIVED FROM A SHORE CONTROL UNIT OVER YOUR ——— RECEIVER NO. ——— AND CONFIRMED WITH YOUR ——— TRANSMITTER GAVE THE LOCATION OF A GERMAN 88 MM. BATTERY HOLDING UP OUR PARATROOPERS. ONE MINUTE OF RAPID FIRE WIPED OUT THE BATTERY. INFORMATION RECEIVED OVER YOUR ——— RECEIVER NO. ——— AND CONFIRMED WITH YOUR ——— NO. ——— TRANSMITTER ENABLED THE DESTROYERS TO BREAK UP AN ENEMY COUNTERATTACK WITH TANKS. OTHER EQUIPMENT MADE BY YOU WHICH FUNCTIONED EFFICIENTLY IN THIS ACTION INCLUDED YOUR ——— RECEIVER NO. ———; ——— AND ——— RECEIVERS NO. ———, AND THE HANDSETS AND HEADSETS OF THE DESTROYERS' INTERCOMMUNICATION SYSTEMS. WE NEED MORE OF THIS FINE EQUIPMENT FOR INVASIONS TO COME."

## Listening-in from "Middle of Nowhere"

LISTENING to broadcasts while "sitting in the middle of nowhere," six to nine thousand miles from the source, has given Lieut. Robert W. Sarnoff, USN, a new perspective of radio, he reveals in a recent letter to his father, David Sarnoff, President of the Radio Corporation of America. Lieutenant Sarnoff is stationed at a base "somewhere in the South Pacific."

An excerpt from his letter to Mr. Sarnoff follows:

"First of all let me thank you for the magnificent radio which arrived in A-1 condition a few days ago. It was beautifully packed and started to work at full blast as soon as I was able to round up some wire, end plugs, etc. My hut has now become the great gathering place, as we all sit around and listen to San Francisco, London, Berlin, Tokyo, and Australia. They all (the stations) come in with strong, clear signals. There is considerable local interference at times (trucks, generators, etc.) but I am having a special antenna rigged up which will eliminate the noise.

"Having accepted radio as a natural, unquestionable fact all my life, I get a new perspective of it out here. It really is an amazing affair, when you consider sitting in the middle of nowhere and hearing clearly six to nine thousand miles away. It certainly helps to make an otherwise cutoff existence more bearable. Many thanks again."



LIEUT. ROBERT W. SARNOFF

## LUCY MONROE STARTS NEW RALLY SERIES

*Industrial "Sings" to Promote Win-the-War Spirit Sponsored Jointly by RCA and WPB.*

A SIX-MONTHS tour of the New England States, New York, New Jersey, Pennsylvania, Ohio, and Michigan to conduct industrial "sings" and patriotic rallies for employees of war plants throughout those areas is being made by Lucy Monroe, Director of Patriotic Music of the Radio Corporation of America, under the joint sponsorship of RCA and the War Production Board.

The object of the tour is to promote morale and "win-the-war" spirit among the soldiers of production who will hear and sing with the "Star Spangled Banner Girl," as Miss Monroe is national known. The officially recommended rally program, timed for 20 minutes, includes brief talks by company and labor representatives and may be featured by a singing contest for employees. The rallies are being presented by the joint labor-management production drive committees of the plants participating.

RCA's "Sing for Victory" coach and sound truck, equipped with microphones, inbuilt public address system, and a small speakers' platform atop the cab of the truck, accompanies Miss Monroe on the tour, for use at plants which may not have an adequate plant broadcasting or public address system.

All leading war plants in the areas to be covered by the tour have been invited by WPB to apply for a place in Miss Monroe's itinerary, with the understanding that her appearance at their rallies will be scheduled wherever possible. Applications are made direct to Daniel D. Halpin, Radio Corporation of America, RCA Victor Division, Camden, N. J.

Miss Monroe's services, the traveling sound coach and individual songsheets for distribution to workers, are being made available through Production Drive Headquarters of WPB by RCA without cost to the plants staging the rallies.

# PLAN POST-WAR TELEVISION

*Trammel Appoints Royal Chairman of NBC Committee to Formulate Plans for Expansion of Art After War—Foresees Rapid Development.*

TELEVISION, in the opinion of Niles Trammel, president of the National Broadcasting Company, needs only the release of vital materials and the services of electronic engineers, both now confined to war needs, to provide the nation with a new and significant service of sound and sight.

"As a supplement to present National Broadcasting Company service, television," said Mr. Trammell, "promises much as a new dimension in entertainment, education and advertising."

### *To Initiate Studies*

Envisaging the rapid development of television immediately following the end of the war, Mr. Trammell in August announced the creation of a post-war television planning committee to formulate plans for the company's post-war expansion of the art. Essential technological studies and the surveys of the problems involved are to be initiated now and the conclusions held in readiness for the first days of peace.

The committee consists of John Royal, vice president in charge of International, Shortwave and Television, as chairman; William S. Hedges, vice president in charge of Stations; O. B. Hanson, vice president and chief engineer, and C. L. Menser, vice president and manager of the Program Department. John T. Williams, assistant to Noran Kersta, now in the Marine Corps, was named secretary.

Currently, NBC is operating its Empire State television transmitter four hours weekly: Mondays, 4:00 to 5:00 p.m., and 7:30 to 10:30 p.m. Hereafter, programming will be under the direction of NBC's Program Department, with Williams and his staff reporting to Menser.

The NBC television committee is coordinating its activities with the research work of the RCA Laboratories at Princeton, N. J., and with the television development plans of the RCA Victor Division at Camden, N. J.

Buy War Bonds

## Sarnoff Meets RCA Cadettes in Indiana

DAVID SARNOFF (RIGHT), PRESIDENT OF THE RADIO CORPORATION OF AMERICA, GREETS RCA ENGINEERING CADETTES AT PURDUE UNIVERSITY DURING HIS VISIT TO INDIANA IN LATE JULY. ACCOMPANYING HIM IS JOHN M. SMITH, GENERAL MANAGER OF MANUFACTURING, RCA VICTOR DIVISION.

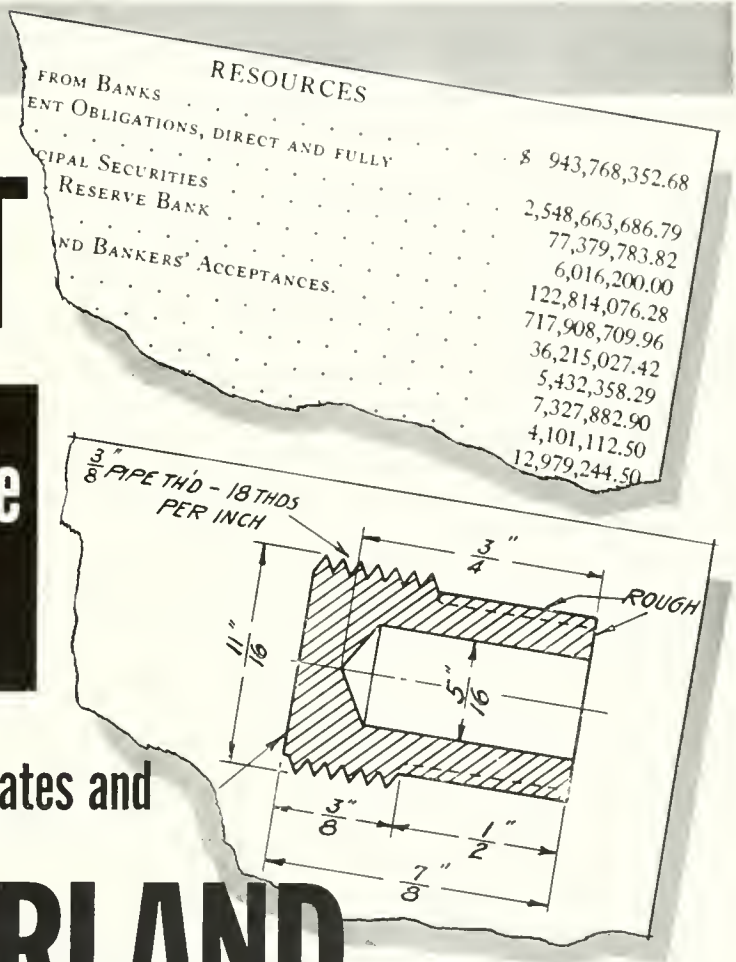


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**is now available . . . for the transmission of diagrams, drawings, financial statements, legal papers and other important documents.**

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A SERVICE OF RADIO CORPORATION OF AMERICA

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RCA

# A Six-Hour Concert Every Night . . . That Nobody Hears



THIS IS the story of a man who plays the piano—in an empty broadcasting studio.

Triumphant chords, nimble arpeggios, brilliant melodies flow from the instrument in startling succession—but nobody ever listens to him.

His job is to tune the pianos at NBC—all thirty-three of them. Every night, he tours the empty studios on a carefully planned schedule. Under his expert fingers, each piano is made to respond until it is at precise concert pitch—ready for a symphony performance or for a boogie-woogie virtuoso.

Every piano at NBC is tuned by him once a week. Every piano you hear played from Radio City is always pitch perfect.

It's part of NBC's routine attention to detail . . . to the very smallest of details that make for better broadcasting. Not of world-shaking importance, perhaps. Yet—if it weren't done?

It is precisely this meticulousness, this almost automatic insistence on having *every* detail and feature of *every* program on NBC as perfect as possible, that enables advertisers and listeners both to depend on NBC for the *best* in broadcasting.

Perfectionism, insistence on quality, care—even for details that no client or listener is directly aware of—*these are some of the things that make NBC "The Network Most People Listen to Most."*


—The National Broadcasting Company

America's No. 1 Network—A SERVICE OF THE RADIO CORPORATION OF AMERICA

# In War or Peace the Finest Ships Rely on RADIOMARINE

THE United States Merchant Marine is now engaged in the most important job in its history . . . supporting our fighting forces throughout the world.

The passenger fleet of the Merchant Marine is making an impressive record delivering troops to our fighting fronts. And Radiomarine equipment is helping to get our troops through safely and on schedule.

The entire facilities of Radiomarine Corporation of America, including its service stations at 21 ports, are devoted to equipping merchant ships and the ships of our armed forces needed to win the war.

When victory comes, the improved radio-electronic equipment developed for war will be made available to all vessels from pleasure craft to luxury liners.



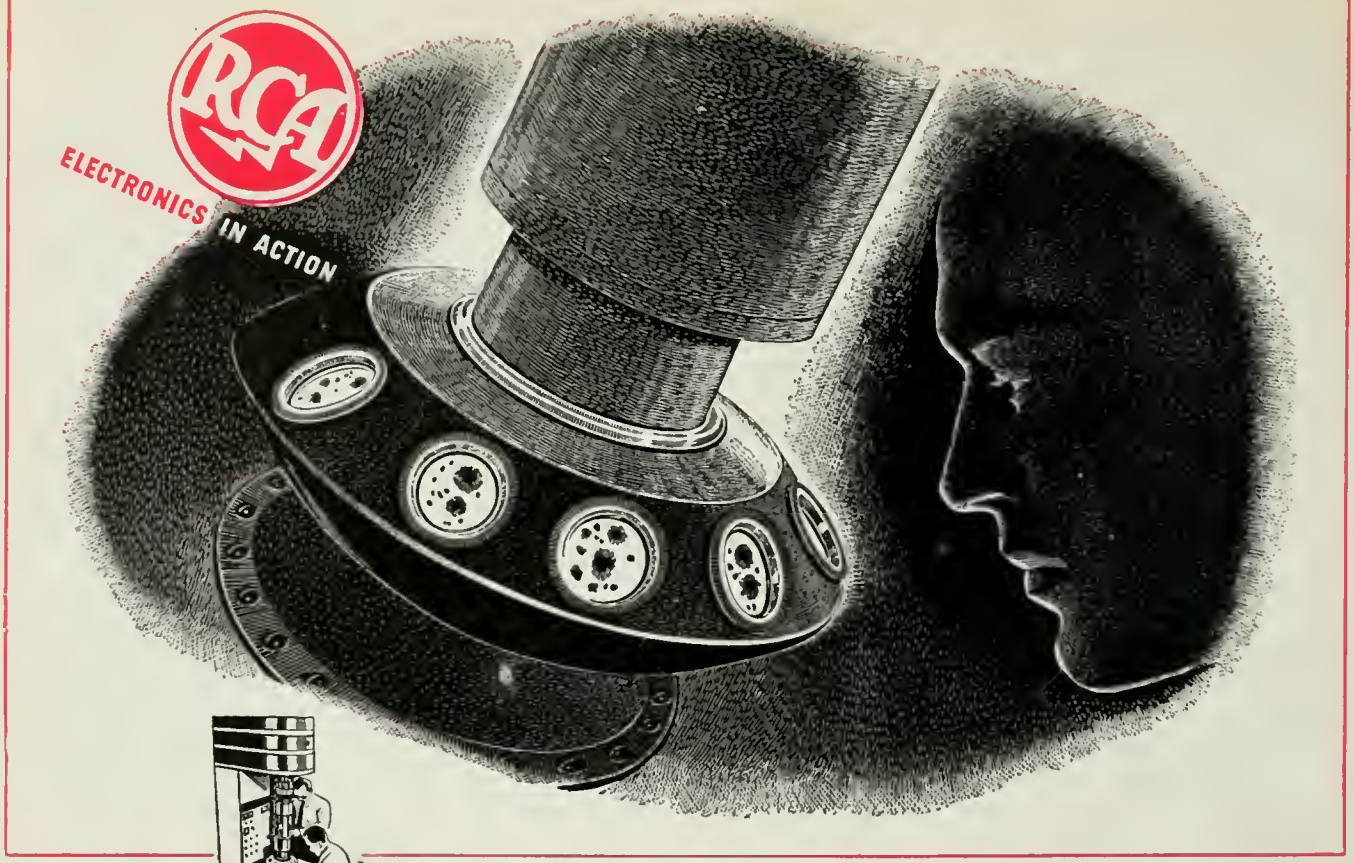
## RADIOMARINE CORPORATION OF AMERICA

*A Service of Radio Corporation of America*

**75 Varick Street, New York, N. Y.**

RCA

ELECTRONICS IN ACTION



## Exploring a New Universe

THROUGH those small round windows—observation ports of an RCA Electron Microscope—this bacteriologist is studying influenza virus—magnified 25,000 times!

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But man *needs* to see these smaller things—among which are long-hidden causes of many diseases destructive to human beings, animals and plants. Man *needs* to be able to peer down, down, down into molecular structures—in order to learn what makes rubber behave like rubber, leather like leather, wool like wool, lubricating oil like lubricating oil, or metal like metal. For under the whiplash of war it is imperative to learn now, not tomorrow, *why* one kind of rubber, leather, fiber, oil or metal is more elastic, tougher, stronger, more useful than another.

*Every branch of science and industry can benefit through proper use of this extraordinary microscope—which utilizes electrons instead of light for illumination.* The RCA Electron Microscope is only one of many RCA applications of *electronics*—the art of harnessing electrons to the service of man. *Every* electronic device of *every* kind depends basically on electron tubes. And RCA is the fountain-head of modern electron tube development.

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ASK ABOUT... RCA INDUSTRIAL ELECTRONIC SERVICE

# RADIO AGE

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Sir Robert Watson-Watt

David Sarnoff

RCA

ANUARY

1944



# Blueprint for Bundists

Suppose that Britain had gone down in those dark days of 1940. How would the Axis have struck at the United States?

It is more than likely that the initial, direct attack would have come from within. And if it had, we can be sure that one of the enemy's first moves would have been the attempt to seize America's broadcasting facilities. For that is an accepted part of the modern pattern of conquest.

Deprive people of their sources of reliable information . . . destroy free radio and substitute the mouthings of Quislings . . . blanket a nation with a barrage of lies . . . confuse, divide . . . make their cause seem hopeless . . . and they'll soon be helpless.

The enemy has his uses of radio—*and we have ours.* Under our system of free radio—*independent, responsible, self-supporting*—people can listen in confidence, hear the truth and unite to fight for it.

* * *

The six stations operated by the National Broadcasting Company—the 135 independently owned stations affiliated with NBC—are business organizations. They draw their revenue solely from advertising. But their services go far beyond entertaining customers of American business and industry. As parts of America's Number One Network they are *important* parts of what makes America a synonym of freedom.

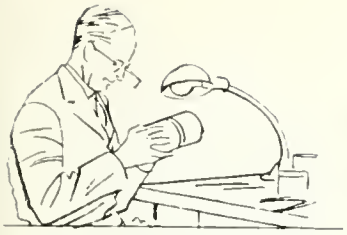

NBC

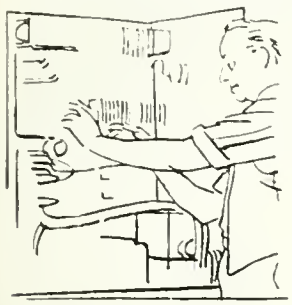
America's No. 1 Network

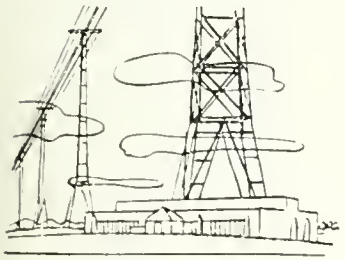
this is the National Broadcasting Company

A SERVICE OF RADIO CORPORATION OF AMERICA

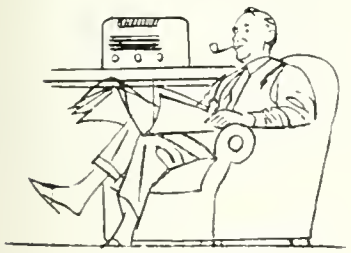
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THE COVER — This excellent full-color photograph of Sir Robert Watson-Watts and Colonel David Sarnoff was made on November 30, when Colonel Sarnoff was host to a British technical mission and a similar group of Americans at luncheon in the RCA Building, New York. (For other pictures and information, see pages 16 and 17)



# RADIO AGE

RESEARCH · MANUFACTURING · COMMUNICATIONS · BROADCASTING

VOLUME 3 NUMBER 2
JANUARY 1944

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RCA TELEVISION RECEIVER BRINGS THE RODEO IN MADISON SQUARE GARDEN TO WOUNDED SAILORS IN THE U. S. NAVAL HOSPITAL, ST. ALBANS. (STORY ON PAGE 24)

# Sarnoff Looks Ahead

## RCA PRESIDENT SEES NEW ELECTRON TUBES OPENING UNLIMITED OPPORTUNITIES—RADIO INDUSTRY NOW BREAKING ALL RECORDS

y David Sarnoff
*resident,*
*adio Corporation of America*

RADIO activity in research, engineering, communication and anufacturing during 1943 may be mmed up in one objective—win ie war! Although wartime secrecy nposes limitations, the end of the ear affords appropriate opportuty to gauge radio's vital role in ie world today, and to measure the gnificance of wartime developents as they may fit into the patrn of the future.

Strongly fortified by the ingenuy and skill of American research id industrial enterprise, radio has ntered its third year of war in the rvice of the United States. Years suspense—a year of defense and year of offense—have gone into story. As 1944 begins, the United ations are on the road to Victory. year of intensified offensive, such the world has never known, is ead. Only time can tell, however, hether 1944 is to be the year of cision—the year of unconditional rrender of the forces which have ought destruction and tragedy on the world.

### *Radio's Role Great*

Radio's great role in global war-are is coordination achieved rough lightning-like communicaon, regardless of distances, natul barriers or the enemy. The plication of radio-electronics to tecting, ranging and navigation being greatly extended with miaculous results. Thus, the future f radio is an ever-increasing circle within whose orbit new peacetime services are being evolved through wartime research and engineering. As keys to the microwave spectrum, more powerful electron tubes are opening the domain of tiny wavelengths, which possess unlimited possibilities in radio and its related fields of electronics, television, radiothermics, supersonics and electron microscopy.

Today, science marches with the victorious armies. It sails with the fleets and flies with the air armadas. The totalitarian powers intent upon conquest, invaded country after country, and perverted inventions of science to warfare. They have failed.

Today, on the wings of the airplane, Victory soars. On the waves of radio, Freedom sends its heartening message around the world. Science triumphant has given winged Victory indomitable power. There is no direct clue, however, to reveal how long and difficult the march to final Victory will be. Until the goal is reached, there must be no letdown in the all-out effort to win the war.

The American radio industry is breaking all records in production and communication. As the New Year unfolds, the "ether" pulses with new vigor. Micro-waves accomplish new wonders. Daily, 400,000 radio-electron tubes are manufactured. Every hour of the day and night, all America is informed by up-to-the-minute broadcasts on the progress of the war. At the same time, short-wave broadcasters are reaching every land throughout the world regardless of enemy restrictions. Tons and tons of apparatus are sent into combat every week. Miles and miles of transoceanic radiotelegraph circuits are vibrant with urgent dispatches, news and communiques. Messages are flashed by automatic high-speed machines at the rate of 600 words a minute.



DAVID SARNOFF

Latest estimates reveal that radio production in the United States is up to $250,000,000 a month against $30,000,000 a month a year ago—all for the armed services. The equipment is the finest and most efficient in the world. America's radio-electronic scientists and engineers have far surpassed Germany's much vaunted super-men of science.

### *Praises Workers' Record*

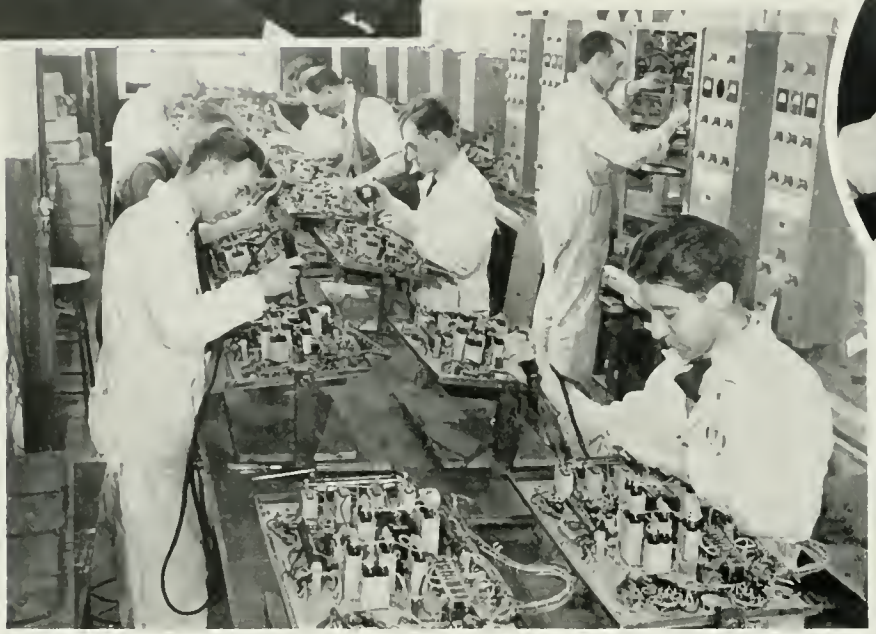
From every theatre of battle, come reports of the outstanding performance of American radio. This speaks high praise for the workers on the production front, who are achieving an unparalleled industrial record. Their patriotic spirit and skill on the assembly lines supplement the courage, initiative and fighting spirit of the men who take radio into battle. A radio flash from a walkie-talkie in a foxhole, or from a handie-talkie on a beachhead, may well be the signal of victory. A radio flash from the cockpit of a fighter plane, or from a rubber liferaft, may turn the tide of a battle, or save the lives of struggling men. Radio's record for 1943 attests the triumphs of the deft fingers that make radio tubes, of the hand that manipulates a

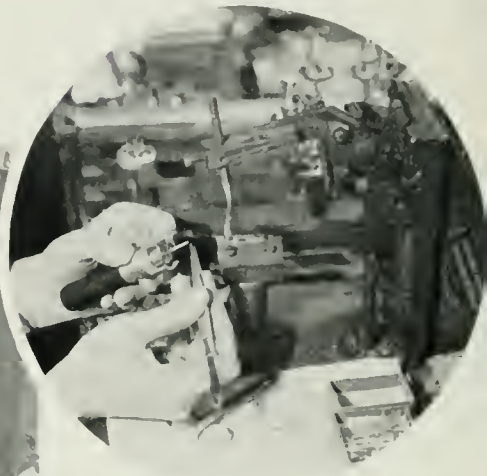


RESULTS OF WAR-TIME RESEARCH IN RCA LABORATORIES POINT TO NEW PEACE-TIME RADIO SERVICES. HERE, EXPERIMENTAL TUBE PARTS ARE BEING REMOVED FROM A HYDROGEN FURNACE.

DELICATE FEMININE FINGERS PERFORM INTRICATE TUBE ASSEMBLY JOB (BELOW) IN RCA VICTOR PLANT. THE RADIO INDUSTRY IS PRODUCING ELECTRONIC TUBES AT THE RATE OF 400,000 A DAY.

THE SCENE BELOW IS FROM AN RCA PRODUCTION LINE, WHICH IS CONTRIBUTING TO THE RECORD-BREAKING VOLUME OF RADIO EQUIPMENT BEING SUPPLIED THE ARMED FORCES.





soldering iron on the assembly line, or the skill of the tester who declares the completed apparatus ready to enter the fight.

In fulfilling its unprecedented wartime responsibilities, radio has taken its place among the great industries of America, offering employment to hundreds of thousands of workers. Since the war began in Europe, RCA employees have increased from 23,000 to more than 40,000. Another 6,000 employees are enrolled as officers and enlisted men in the military services. Many of them are in the front-line of communications — they strengthen, maintain and operate the life-line of Victory.

It is a tremendous task to supply radio instruments and installations to our army of 8,000,000 men aligned on a global front; to meet the needs of our allies for radio, and to install radio apparatus in thousands of aircraft, warships, transports, tanks and mechanized units as well as in all airfields and outposts. This task is intensified by new and exacting specifications of war, ruled by all sorts of conditions related to topography, seas, weather, climate, and altitude. Radio apparatus, subject to constant movement, rough handling and assault in the field, on the seas and in the air, must be rugged to be dependable. Our fighting men know and appreciate that the radio research men, engineers and production workers have succeeded in meeting the demands of war. Their craftsmanship keeps faith with science as well as with the Army, Navy and Air Corps.

### *Serve Home Front*

American-built radios have been under fire now for more than two years. Within that period home-radios in the United States have been used as never before as a source of news and entertainment. A home without a radio is out of tune with the world. Americans everywhere have an ear to the battlefronts. There are 60,000,000 receiving sets; 31,000,000 "radio families"; 900 broadcasting stations; 14 American international short-wave transmitters; millions and millions of radio-electron tubes glow in the service of the Nation and its people.

The fact that our civilian radio service is not disrupted during these war years, when all-out effort and materials are directed to winning the war, is high commendation of the quality of American radios as designed for the home. In this country broadcasting has not been distorted by censorship, nor put under absolute government operation and strait-jacketed by stringent rules on listening. Americans listen to enemy broadcasts without danger of death-penalty or imprisonment. All this liberty in wartime is proof of radio's faithful alliance with Democracy and the Freedoms.

Scientifically, the outstanding developments of 1943, as those of 1941-42, are classified as military secrets. It violates no secret, however, to report that outstanding ad-

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vances have been made in the use of radio sound and sight. Nothing in radio is ever new for long, even in peacetime. War, however, changes the old order of things even more rapidly.

New instruments and new services are in the offing for peace. The wartime pace that science is called upon to maintain is breathtaking. Nevertheless, American radio keeps up with it. Our laboratories are creative beehives of activity; our manufacturing plants are arsenals; our communication waves are lifelines. To reconvert them all to peaceful pursuits will present a great challenge to the radio industry. It will be a most promising field for post-war employment and opportunity.

When the war ends American industry must not be without a chart for the future. The post-war era will bring many challenges and problems to test American leadership and enterprise. Few industries compared to radio hold greater opportunity for the solution of problems relating to industrial progress and employment or the maintenance of the American standard of living. Industry must be prepared to reconvert as quickly as possible from war to peace, yet without the slightest neglect or relaxation in the total war-effort of the present.

Radio as an industry is fortunate to have television as a postwar development of great promise and popular appeal, able to open a new era in service to the public.

### *New Things to Come*

There should be no expectation, however, that when the war ends the air will be transformed overnight to television. It will require from 3 to 6 months to get the machinery in operation to resume the manufacture of civilian broadcast receivers. It may require a year after approval of standards and full authorization of commercialization of television broadcasting by the Federal Communications Commission before television sets are available within the price range from $200 to $300. Production of television receivers is not the only task. Television transmitters must be erected. Interesting programs must be planned. Automatic radio relay stations must be built to link key cities into a network. That is no one-year job.

Alongside of television, "FM," or frequency modulation on ultra-short waves, holds great promise of becoming an added feature in broadcasting. Even now "FM" carries the sound part of television. In both television and "FM," much scientific progress has been made in connection with the application of radio to the war. The home-radio instrument of the future will be a combination television and sound-broadcast receiver incorporating "FM" and a phonograph.

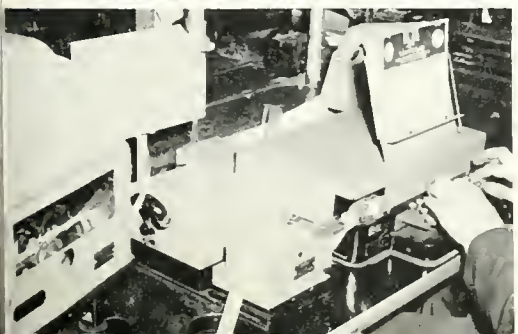
Outside the realm of radio communication, the application of radio-thermics, or radio heating, is finding widely extended use in industry. The use of high-frequency waves for heating is a wartime development of no small achievement. It is accelerating and increasing the efficiency of numerous industrial processes.

The electron microscope, now produced under a high wartime priority rating, will be made available over a vast field of usefulness after the war. It will be compact

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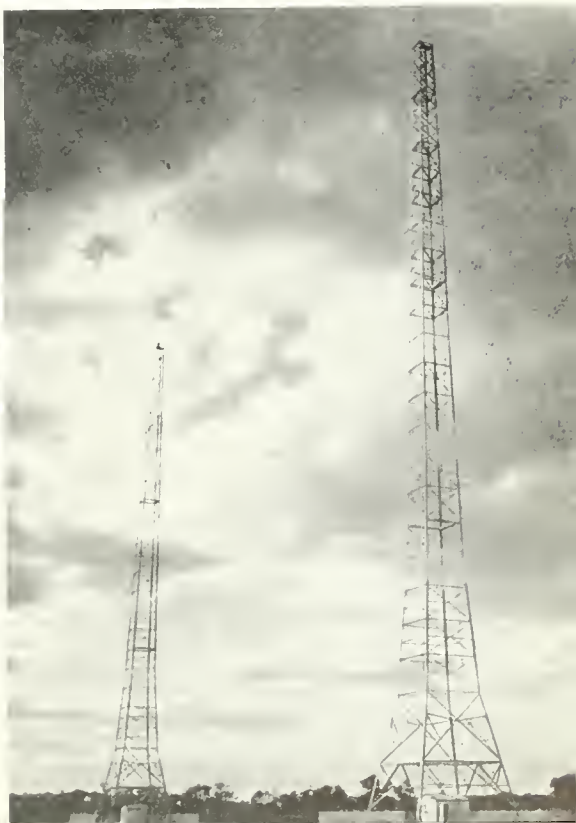
SPECIAL RADIO COMMUNICATION UNITS, DESIGNED BY ENGINEERS OF RADIOMARINE FOR LIFEBOATS, ARE PROTECTING LIVES OF THOUSANDS OF AMERICAN SEAMEN.





HIGH-SPEED MULTIPLEX RADIO-TELEGRAPH PRINTERS AT RCA COMMUNICATIONS TRANSMIT WAR-VITAL MESSAGES ACROSS THE SEAS AT THE RATE OF HUNDREDS OF WORDS A MINUTE.

THESE TOWERS OF WEAF, KEY STATION OF THE NBC NETWORK, SERVE THE HOME FRONT WITH UP-TO-THE-MINUTE NEWS AND ENTERTAINMENT.



and portable, and its service will be greatly increased. In addition, RCA Laboratories has succeeded in developing an electron micro-analyzer, which, incorporating an electron microscope, enables atomic identification of the chemical elements comprising submicroscopic particles of matter. For example, if there is iron in the nucleus of a bacterium, the micro-analyzer detects it.

Because of spectacular wartime developments, radio apparatus will be adapted for collision prevention to aircraft, ships, railroads and possibly automobiles. All this will be part of the new service of radio in an era of sight control made possible by the development of electron tubes in the field of microwaves.

### *New Tubes Foreseen*

As new electron tubes always serve as keys to major advances, so in broadcast reception, new and tiny tubes—smaller than acorns—may introduce "personalized" radio. Small, compact receivers, and even transmitters may be built in a little case that will slip into a pocket. The uses to which such "stations" may be put gives the imagination much to play upon.

All these new developments will not be realized in 1944, but with 1944 as the year of expected decision in the European war, they will date from it, as radio broadcasting dated from 1919.

The new ideas, tools and instruments of progress that emerge from the war may well give us 1960 radio in 1950. War shrinks the lapse of time between invention and its practical use. The merit of a discovery is quickly appraised and harnessed.

While we can see all these signs of progress, we must not lose sight of the losses suffered to the world through the casualties of battle. The boy who fell in the jungles of Guadalcanal, on the sands of Africa, on the road to Rome, who vanished in the Atlantic or Pacific or parachuted into the realm of missing warriors, may well have carried with him a revolutionary idea. When we review a year of war we wonder what might have been the fate of wireless had war taken the lives of such men as Maxwell, Hertz, Marconi, deForest, Alexanderson, Armstrong and Zworykin, in their youth.

But the young men, lost to the world and to science in this war, have, in their supreme sacrifice, made it possible for the civilized world to progress; they have contributed far more than invention. They have made future invention possible by the defense of a civilization in which men can think, study, work and achieve for the welfare of mankind under freedom and justice.

We may look forward to 1944 with high hopes, bulwarked by a determination never to break faith with those who have fallen, or with those who are marching with the Stars and Stripes, on the bomb-infested road to Victory.

RADIO-ELECTRONIC DEVICES, SUCH AS THE RIVET DETONATOR (RIGHT), HAVE GREATLY SPEEDED UP PRODUCTION FOR WAR IN NUMEROUS BRANCHES OF INDUSTRY.



TWO TYPES OF THE ELECTRON MICROSCOPE (LOWER LEFT) HAVE BEEN DEVELOPED IN RCA LABORATORIES BY DRS. JAMES HILLIER, LEFT, AND V. K. ZWORYKIN. THE LARGER, STANDARD, MODEL IS SERVING WAR-TIME RESEARCH.

LARGE-SCREEN TELEVISION RECEIVERS FOR THE HOME (LOWER RIGHT) HAVE BEEN DEVELOPED EXPERIMENTALLY BY RCA, AND ARE PART OF TELEVISION'S POST-WAR PROMISE.





# Radio Vital to Victory

## HARBORD SAYS SCIENCE OF RADIO-ELECTRONICS IS IMPORTANT FACTOR IN WINNING THE WAR—REVIEWS MILITARY USES

By Lieut. Gen. James G. Harbord

*Chairman of the Board,*
*Radio Corporation of America*



LIEUT. GEN. JAMES G. HARBORD

THE Second World War has been called a "radio war," because the science of radio-electronics is an all-powerful factor in the formula for Victory. The nations which make the most efficient and strategic use of the radio spectrum in this war possess an outstanding advantage. There is every indication that the United Nations, unsurpassed in scientific resources, have gained the initiative in offensive on the highway to Victory. I have every confidence that the advance will continue. When the war will end no man can predict; there are too many imponderables. They cannot be figured mathematically. Unpredictable human behavior and morale are not accurate factors in mathematical calculation or in formulas of world-destiny.

### *Helps Time Attack*

Global warfare on the vast scale and at the high tempo at which this war is being conducted could not be waged successfully without radio-electronics. The infantry, mechanized units, warships, transports, bombers and fighter planes would be tremendously handicapped without radio communications.

Radio helps to time the attack; to locate the enemy and aid the artillery in accurately placing its shots. Radio is the voice of the commanders on the beachheads and at the bridgeheads, of troops in foxholes and of sailors in lifeboats or on rafts. Radio coordinates military and naval operations; it saves lives, time and materiel. The split-second precision of the mighty air squadrons flying over Berlin would be impossible without radio instructions, coordination and navigation. Radio at the same time is used to confuse the enemy, to prevent concentration of intercepter forces, and to draw enemy fighter planes to another city distant from the target. There were no such radio tactics in the First World War. Radio then was used chiefly for exchange or delivery of messages, but on a greatly limited scale compared to its modern uses.

Every war sheds light on new military and scientific developments. The flintlock rifle was a radically new weapon in the Revolutionary War. The telegraph, transatlantic cable, photography and armored vessels were innovations of the Civil War. During the Spanish-American War, magazine rifles came into action. In the First World War, we had automobiles, trucks and tanks for the first time; the airplane found a comparatively limited use; the electron tube, the radiophone and short-wave radio gained new prestige.

Now, in the Second World War we are witnessing the greatest of revolutions in military operations. It marks a summit of all the Ages in use of scientific weapons—radio, aircraft, mechanized units, and more accurate and long range artillery. The world has never seen armies hauled around so quickly over such vast areas. Even within our own country, before the soldier completes his training and goes overseas, I am told that the average man makes at least six railroad trips. When he arrives on foreign shores, he can hear broadcasts of news and entertainment from America. He can have a piece of apple pie and go back for seconds in the African desert, or he can eat ice cream in India! No war has ever witnessed the transport of men and supplies as in World War II. Military leaders fly from outpost to outpost, from battlefront to battlefront in a matter of hours while 25 years ago the same journey would have consumed weeks, perhaps months of dangerous travel across mine and torpedo infested seas. Warfare in a quarter century has been revolutionized by science—by radio, the airplane and mechanized units but soldiers with rifles are still necessary to win a war!

### *New Fields Listed*

When the full story of the Second World War is written there will be amazing revelations of radio's participation through every phase of its activity. New developments in radio-electronics will come to light. New uses will be disclosed in the application of radio as a navigational aid, in averting collisions, in "blind" flying, and in development of many devices such as tiny, lip microphones, new electron tubes, metal locators, automatic direction finders for planes and ships, all of which will be converted to peacetime pursuits.

# Tubes Key to Progress

*ULTRA-HIGH FREQUENCY, MICROWAVE FIELDS ARE LIKENED BY THOMPSON TO UNDEVELOPED LANDS OF WEST 80 YEARS AGO*



By B. J. Thompson
Associate Research Director
*RCA Laboratories,*
*Princeton, N. J.*

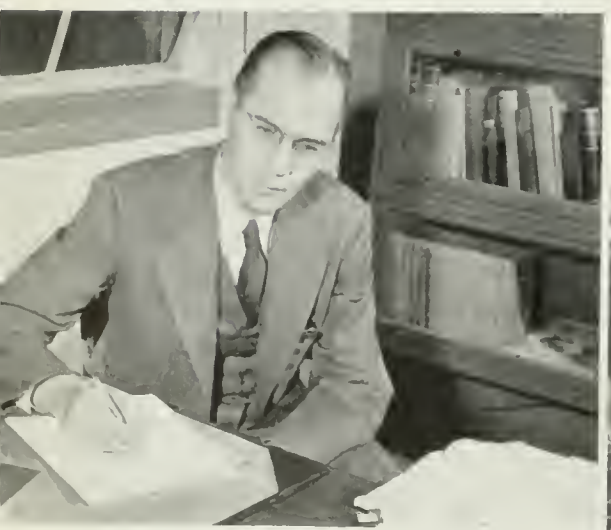
ONE hears a great deal about electronics these days. It is promised that electronics will do almost everything to make life easier and more enjoyable after the war. The scientists and engineers who have been engaged in vacuum-tube research and development find themselves a little bewildered and perhaps a little resentful of all the talk about electronics for two reasons. First, they have called their own field of specialization "electronics": the name of their profession is being stolen before their eyes. Second, they feel that electronics (in its present broad meaning) is not new, and they wonder at the sudden shouting and excitement.

Those who have time these busy days to philosophize briefly over the matter may readily reconcile themselves to the situation, however. The theft of the name of their profession is a tribute to the importance of the work which these men and their predecessors have done. And the sudden excitement may be justified by the remarkable wartime accomplishments of electronics and the reasonable expectations for peacetime contributions to come.

Normally, it is not for the scientist to blow his own horn. But the men who have been devising new kinds of vacuum tubes have heard so often that "the tube is the heart of radio" and, more recently, that "the tube is the heart of electronics" that they may be forgiven for believing it. The engineers and scientists who create new radio transmitters and receivers, television equipment of all sorts, and the electronic devices used in war and in industry seem almost invariably to start their work by coming to the vacuum-tube engineers and saying "we need a new tube to meet our requirements; without it we cannot do our job." The tube engineer is convinced that his work is either the keystone of electronics progress or the chief obstacle to progress, depending on its success or failure. In any event, he knows that he personally is one of the principal bottlenecks in the war effort. That is why he looks even a little more haggard than his fellow technical workers. Nothing can be said publicly of his wartime accomplishments to cheer him up, but it might not be inappropriate to look at some of his past work.

RCA Laboratories is one of a number of important American laboratories in which the full technical effort of the staff is devoted to developing new military applications of radio and electronics—developments which have contributed and will contribute to shortening the war and to assuring victory to the United Nations. The engineers and physicists of RCA Laboratories who are engaged in developing new vacuum tubes were fortunate in being able to turn as a team from their peace-time pursuits to an all-out war effort with little change in the nature of their work.

In the days before the war, the







IN RCA LABORATORIES, DR. D. O. NORTH (LEFT) COMPUTES THE PERFORMANCE TO BE EXPECTED OF A NEW TUBE, ONE OF THE EARLY STEPS IN A RESEARCH PROJECT; B. KULLEY (CENTER), USING JEWELER'S LATHE AND MAGNIFYING SPECTACLES, MAKES A SMALL PRECISION PART, AND DR. R. TRUELL (RIGHT) OPERATES A HYDROGEN-FILLED, QUICK-HEATING BRAZING UNIT.

electron tube research of RCA Laboratories was largely concentrated in two fields, ultra-high frequencies and television. Years before, these men had helped to produce the great variety of tubes required for modern radio receivers and transmitters and for industrial and scientific applications of electronics.

The story of the beginning of applied electronics has often been told. The Fleming valve and the DeForest audion, in 1903 and 1906, greatly improved the sensitivity and reliability of "wireless" receivers. These were the first "vacuum tubes," and all later developments in electronics stem from them. About 1912, the triode oscillator and the amplifier were developed. These notable contributions were not tube developments, but were exclusively circuit accomplishments. Engineers had suddenly learned how to use tubes in their two most important applications. Tubes could be used to generate high-frequency oscillations and to amplify very weak radio signals. The importance of tubes was greatly increased, leading to intensive effort in several large research laboratories directed toward understanding and improving vacuum tubes. Developments came rapidly. The scientific effort devoted to tubes has increased continuously ever since, and the results in new accomplishments have not diminished.

The early vacuum tubes were small affairs and were used entirely for radio reception. The high-frequency oscillations required for transmitters were generated by sparks, the Poulsen arc, or by great, high-speed rotating alternators not very different, superficially, from the "dynamos" one sees in electric power stations. Each of these sources had serious limitations. If high-power tubes could be constructed, vacuum-tube oscillators could be used as generators for radio transmission. By 1915, the first practical transmitting tubes had been demonstrated. The vacuum-tube oscillator proved to be so greatly superior to other generators for radio transmission that, by the early 1920's, there was no further development or manufacture of any other type of generator.

### *Early Tube Developments*

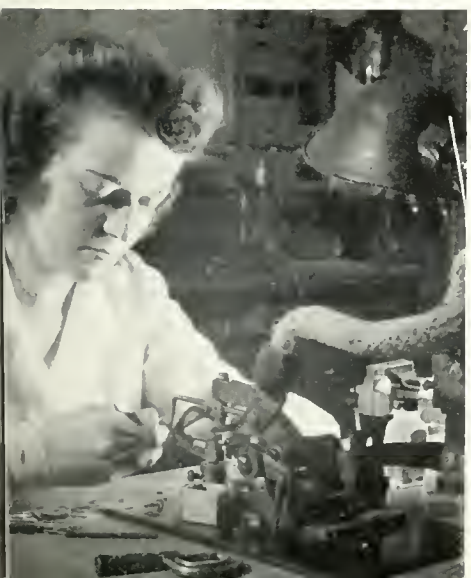
When radio telephony came along about 1915, high-power tubes were essential as modulators to impose the voice signal upon the radio waves. Without these large tubes, radio would have been confined to telegraphy. Our modern radio broadcasting, begun in 1920, is simply an outgrowth of the radio telephone.

The first World War contributed much to the development of vacuum tubes. There was intensive effort devoted to the development of radio for military communications. As usual, the tube was the bottleneck. This resulted in many important developments in the way of tube design and manufacture, which later facilitated the great expansion of radio that began with broadcasting.

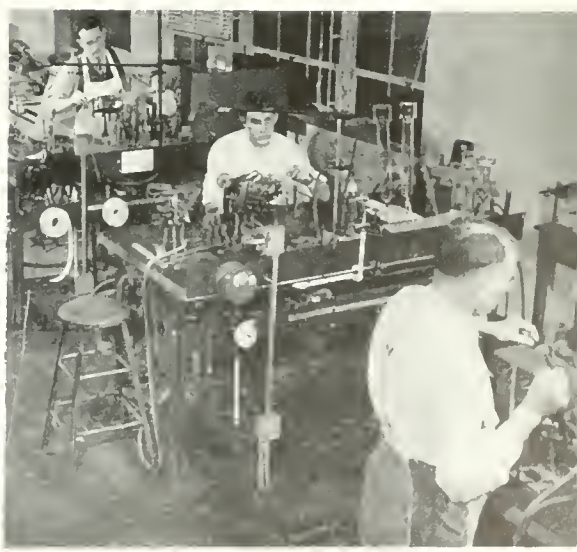
From the end of the war until 1927, the most noteworthy tube developments were in the direction of producing more powerful and more efficient transmitting tubes and more reliable and more economical receiving tubes. The high-vacuum receiving tube for use in radio-frequency amplifiers made its appearance. Tubes which took little power to heat the filament were produced, making possible receivers operated by dry batteries. These developments may seem modest in looking back, but they were of almost as much interest to millions of radio "fans" of that day as the latest models of automobiles were to motorists in the days when there were new models. A man knew and took pride in the fact that his receiver was a Radiola and contained six UV199's.

In 1927, the home radio receiver ceased to be a plaything requiring much attention and became simply an instrument for receiving radio programs which could otherwise be ignored. This change came about through alternating-current operation, made possible by the development of tubes in which the cathodes or filaments could be heated by

FRANCES KAWALEK (LEFT) OPERATES AN ELECTRONICALLY-CONTROLLED WELDER IN EXPERIMENTAL TUBE ASSEMBLY; ADELE RZESUTEK (CENTER) USES A SPECIAL ALIGNMENT JIG UNDER A TOOL-MAKER'S MICROSCOPE FOR FINAL ADJUSTMENTS OF A TUBE ASSEMBLY; AND A SECTION (RIGHT) OF THE GLASS-BLOWING ROOM, WHERE HIGH SKILL IS ESSENTIAL.







alternating current, thus eliminating the "A" battery. The "B" battery was eliminated by the use of new rectifier tubes. This development was promptly followed by the screen-grid tube, which was noteworthy because it represented the first revolutionary improvement in tube design since DeForest added a grid to the Fleming valve.

The screen-grid tube had simply another grid but the fact that a second grid would be any better than a second steering wheel on an automobile had not been obvious. The technical results obtained by the use of the second grid were of major importance. Perhaps of even greater importance was the fact that the way was opened for a great diversification in tube design through the use of additional grids and other electrodes, making a tube a specialized item designed for a particular purpose. The tube engineer was now under pressure to produce a tube tailor-made to fit a given job. As a result, the number of tube types available commercially increased from a dozen or so to several hundreds within ten years.

In the past fifteen years, much effort has been devoted to the study and development of the ultra-high radio frequencies. If tube engineers could have turned out promptly tubes which would meet the specifications of other engineers who were impatient to develop this virgin territory, the problems would have been solved long ago. Instead, they have moved haltingly, at first taking small, unsure steps. But they have moved forward and with increasing pace. It is certain now that after the war we shall see the development of the extremely high radio frequencies in a manner almost undreamed of ten years ago. These developments will include such things as the radio relay and navigation aids which will prevent collisions of ships at sea and will enable planes to navigate and to land under any conditions of visibility.

The ultra-high frequencies have been—and still are—the great field for expansion in radio. They are to radio what the undeveloped lands of the West were to American agriculture eighty years ago. Radio transmission for any purpose uses a portion of the radio-frequency spectrum. At the lower frequencies, its use for one purpose prevents its use for any other purpose, at least in that geographical vicinity and perhaps in the whole world. New developments in radio, in general, are possible only by turning to unused portions of the spectrum. These unused portions, by the very nature of things, can be found only by going to higher frequencies. This situation has long been recognized. There have been many proposals and much experimental work directed toward development of the ultra-high frequencies. But always progress has awaited the development of suitable tubes.

One of the very attractive possibilities involving the use of the ultra-high frequencies is the radio relay system. Ralph R. Beal has recently discussed (*Radio Age*, October, 1943) this system as it may be developed after the war. It is no secret that RCA Laboratories engineers were actively engaged on this development before the war. As they envisaged the system, television, facsimile, voice, and telegraph signals could all be transmitted simultaneously across the country from one "light-house" tower to another on narrow beams of ultra-short waves, or microwaves. When they laid their plans they knew the radio frequencies they would need to use. The serious difficulty they faced was that there were no suitable tubes for their purpose. They then turned to their co-workers, the tube engineers, and explained their needs.

Working in co-operation with the engineers developing the complicated radio equipment for the relay towers, the tube engineers produced several new kinds of tubes meeting the requirements of the relay system. One of these was the inductive-output tube, embodying entirely new principles especially suitable for ultra-high-frequency amplification. In this tube, the energy is taken from the electron stream directly through the glass walls of the tube without wire connections.

With the coming of the war, the radio relay system had to wait while more urgent matters were taken care of. After the war it seems certain that the system will be developed commercially and that



LIQUID AIR, TEMPERATURE 313 DEGREES BELOW ZERO, FAHRENHEIT, IS USED BY J. BURNETT TO IMPROVE THE VACUUM IN A TUBE WHEN IT IS COMPLETED. BELOW, H. A. FINKE TAKES PERFORMANCE DATA ON A RESEARCH TUBE AS IT IS PUT THROUGH ITS PACES IN AN ELABORATE SERIES OF ELECTRICAL TESTS.



it will prove to be of great value. One cannot say now whether the post-war relay system will use the tubes developed for it before the war or whether, instead, some of the great wartime developments will be used. In any case, the success of the radio relay depends on the new tubes which are made available in the ultra-high frequency or microwave region of the spectrum.

What has been said of the intimate relationship between tube developments and the application of microwaves to the relay system applies to almost all other applications of microwaves. For new applications, new tubes are required.

### *Outstanding RCA Record*

In the field of television, the record of RCA Laboratories physicists and engineers is outstanding. Television became an electronic art—and a practical possibility—through their development of the Iconoscope and the Kinescope. The Iconoscope receives the optical image of the scene to be transmitted, stores it, analyzes it into its elements, and converts it into electrical impulses for transmission. The Kinescope converts the electrical impulses at the receiver back into an image for viewing.

Remarkable as was the performance of the Iconoscope and the Kinescope, further progress was demanded. The Iconoscope required too much light for the transmission of a satisfactory picture. In the studio, the performers complained of the glare and the heat. Outdoors, the last quarter of a football game on a rainy November afternoon, when viewed on a television receiver, might become lost in the "snowstorm" of background disturbances, similar to "noise" or static in the case of sound broadcast programs when the signal is weak. An increase of tenfold in sensitivity of the Iconoscope was demanded. To the Iconoscope experts, this was an almost impossible demand—but only almost.

The first step for a research man in solving a problem is to analyze it. The Iconoscope stores electrical charges produced by photoemission and then converts these charges into signal current. For many years, research has been conducted on photoemission by hundreds of scientists for many purposes. It appeared that the Iconoscope already had been given a photoemissive surface nearly as sensitive as could be expected. Research directed toward further improvement could pay only small dividends. Looking at the next step in the process, the research men knew that only about 10 per cent of the stored electrical charge was finally converted into a useful signal. If this conversion efficiency could be increased to 100 per cent, the desired tenfold increase in sensitivity would be achieved. It was well known that the 90 per cent loss of stored charge was caused by the scattering of the "secondary" electrons knocked out of the target by the high-speed electrons of the scanning beam. There seemed no satisfactory way to control these secondary electrons so it was decided to eliminate them completely. To do so would require that the target be scanned by a beam of very low-speed electrons. No one had ever found a way to focus and control such a beam so the solution of the problem required invention of a high order.

The story of the development of the more sensitive Iconoscope—now called the Orthicon—is a highly technical one which can hardly be told here. The necessary inventions were made and the ideas were developed to practical form through much painstaking research with the result that the Orthicon met the "almost impossible" requirements which had been specified to the tube research men. This development made it possible to transmit by television scenes which previously had been too dim. One of the most interesting aspects of the development is that a new path was opened, the following of which promises further large increases in sensitivity. The day may come when any scene which is illuminated brightly enough so that one can see it directly can be transmitted by television.

### *Projection Kinescope*

The Kinescope, too, was found short of perfection. The television image in the receiver was reproduced on the end of a glass bulb where it was viewed directly. Naturally, the picture could be no larger than the end of the bulb. The high cost of large glass bulbs limited the size of the picture to perhaps twelve inches on the diagonal as a maximum. This was large enough for a few people to enjoy the picture, but it would obviously be very much better if the picture could be considerably larger. There was even a demand for a picture large and bright enough for a theatre.

The solution of this problem was by no means easy. Several different approaches were tried. One of the more obvious was also one of the least hopeful: the projection Kinescope. The idea was simply that the picture would be projected on a screen from the end of a small Kinescope by the use of a projection lens, much as in a magic lantern. The great weakness with this proposal was that not enough light could be produced on the end of the necessarily small Kinescope to provide a satisfactorily bright picture of useful size, even using the best



DR. H. B. DE VORE MAKES A PRELIMINARY ADJUSTMENT ON THIS HIGH-VOLTAGE TEST CAGE, IN WHICH THE TUBE IS FINALLY CHECKED IN A COMPLETE CIRCUIT.

and most expensive lens which could be bought.

Thorough analysis of the factors limiting the brightness of the picture on the Kinescope, hard work by a considerable number of physicists and engineers for some years, and a number of flashes of inspiration eventually led to a remarkable increase in the brightness of the Kinescope picture. The problem still was not satisfactorily solved and there seemed little more to be gained in the brightness of the Kinescope picture. The electronics research men—experts in the field of electron optics—had long been unhappy that so little of the light their projection Kinescopes produced was gathered and used by the lens. In the case of an f/1.5 lens—miniature camera fans will know what that means in optical perfection—less than 10 per cent of the light was used; 90 per cent was wasted!

### *Produce New Lens*

In spite of the fact that the optical experts said it was impossible, the electron optics men set about the task of producing a better optical system. Since they could hardly hope to produce a better conventional lens than the great optical companies had produced after many years of research, what was needed was a radical idea. Through their own efforts, they eventually produced a reflective optical system with a "speed" of f 0.7 — which means that it gathers nearly four times as much light as the best conventional lens.*

In industrial control and industrial heating—certainly among the most important fields of electronics—there already have been developed a host of tubes to serve as tools for a great variety of jobs, some of them having been borrowed from radio and many having been developed for the particular purpose. Great developments in these fields will certainly come and it may be expected that tube engineers will be called on to contribute their part.

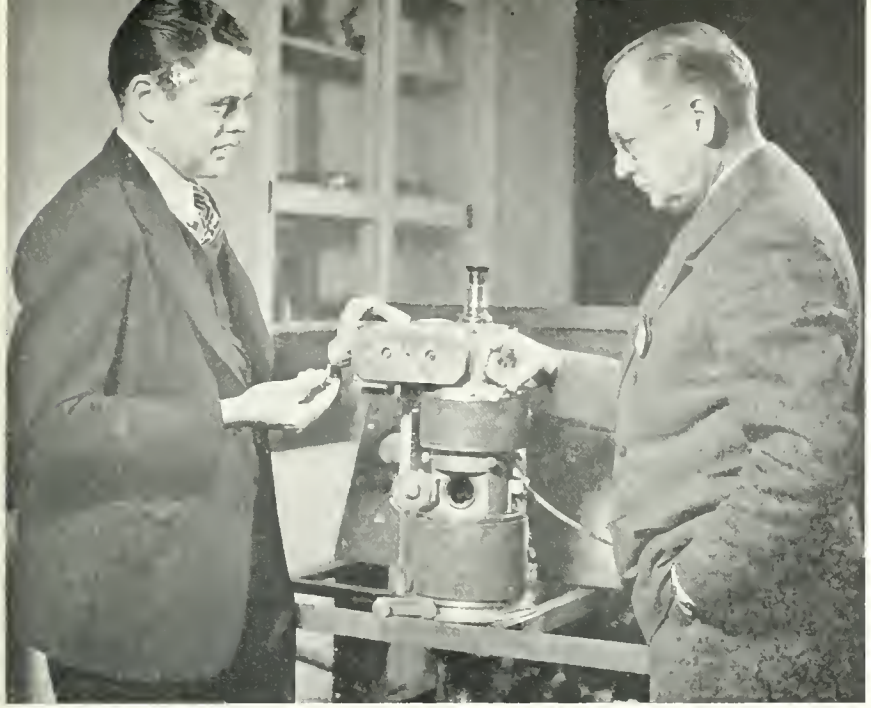
In looking to the future, it seems reasonable to expect an acceleration in the rate of development of radio and electronics. After the war, the peace-time tasks will not simply be picked up where they were dropped. Much has been learned in the war effort which will contribute to man's entertainment, comfort, and safety. Whether or not electronics will live up to the very rosy predictions now being made for it is not for the research man to say. His field is not prophesy. He has confidence that the combined efforts of many research men will solve the technical problems put before them. The electron tube research man expects that he will continue to have his full share of the work.

Buy War Bonds



THIS DISPLAY OF TUBES REPRESENTS ONLY A FEW OF THE ULTRA-HIGH FREQUENCY POWER AND RECEIVING TUBES, CATHODE-RAY AND ELECTRON MULTIPLIER TUBES DESIGNED BY RCA RESEARCH MEN.

* This development is discussed more fully in an article by I. G. Maloff, which will be found on page 25.



DR. JAMES HILLIER (LEFT) AND DR. V. K. ZWORYKIN DEMONSTRATE THE NEW ELECTRON MICRO-ANALYZER. DR. HILLIER PREPARES TO INSERT A SPECIMEN, WHILE DR. ZWORYKIN HOLDS THE PHOTOGRAPHIC PLATE.

# DEVICE IDENTIFIES ATOMS

*Electron Micro-analyzer Developed by Dr. Hillier in RCA Laboratories Reveals Chemical Composition of Ultra-microscopic Matter.*

IDENTIFICATION of atoms in ultra-microscopic particles of matter no larger than 1/100,000 of an inch in diameter can be accomplished quickly and accurately for the first time by a revolutionary new tool of science—the electron micro-analyzer — developed experimentally by Dr. James Hillier of RCA Laboratories.

Revealed by Dr. Hillier in a letter published in the current issue of the magazine *Physical Review*, the new instrument — like the RCA Electron Microscope — promises to go far toward overcoming one of the great barriers to the accumulation of knowledge about the infinitesimally small particles of matter of which all things are made. Information vital to the solution of many practical problems in the physical, chemical, and biological sciences, according to Dr. Hillier, can be obtained.

"The chemical elements constituting such unimaginably tiny objects as the head or tail of a bacterium or virus," he said in an interview today, "can be identified within a few minutes by this new instrument."

Supplementing the electron microscope, the micro-analyzer comes ever closer to observing the building blocks of nature, Dr. Hillier explained. Scientists in recent years have been turning up invaluable information as to the size, shape, and internal structure of microscopic particles of matter, and now they can identify the atoms of which they are made.

"The vital question: 'Of what particular atoms, or chemical elements, are these different particles of matter constructed?' can be answered by the electron micro-analyzer," he continued. "For the first time, the scientist, using this new instrument, will be able to determine the chemical constituents of a particle weighing only $10^{-15}$, or 1/1,000,000,000,000,000, grams. And, more important still, he will be able to see the relationship of the particles to the rest of the specimen under examination."

In operation, the micro-analyzer uses an "electron needle" of extraordinary fine focus to knock other electrons loose from their parent atoms in the specimen, measures the amount of energy lost by the incident electrons in the process, and thereby reveals the specimen's chemical content.

"With the new instrument, the image of the specimen may be observed by means of an electron microscope, which is incorporated as a part of the micro-analyzer, and a selection made by the exact portion to be analyzed," Dr. Hillier said. "Then by manipulation of a few controls, a photographic exposure is made of what we call the 'electron velocity distribution.'

"This results in a series of small marks on the photographic plate, each one of which indicates by its position the presence of a chemical element in the specimen. Thus, with one exposure, information is obtained that would have required weeks or months to obtain by present indirect methods, which too often result in failure."

In explaining how the instrument works, Dr. Hillier pointed out that in the table of chemical elements each atom, or element, is differentiated from another by the number of electrons surrounding the atom's nucleus. The electrons are arranged around the nucleus in "shells," he added, and it is known how much energy, or voltage, is required to knock holes in the shells of different atoms.

"In the micro-analyzer," he continued, "the electrons of the 'needle' that strike the selected area of the specimen are all moving with the same velocity, say 50,000 volts. After they have passed through the specimen area, some of the electrons—the ones that struck atoms —are traveling with less velocity, or energy.

"The next thing of importance in micro-analysis is the fact that the energy loss suffered by the speeding electron is different for each chemical elements. What's more, the differences are large enough to be easily distinguished by a method of measuring electron velocities. If,

for instance, one of the energy losses shown is 298 volts, we know that a carbon atom has been struck; if it is 400 volts, the element is identified as nitrogen, and so on."

An experimental model of the electron micro-analyzer has been set up by Dr. Hillier in the RCA Laboratories at Princeton, N. J. Test operations have been highly successful, although much further work in developing techniques of application must be done before the instrument can be made available for general laboratory use.

### *Gives Elemental Analyses*

In discussing the future significance of the micro-analyzer, Dr. Hillier said that before the extra information being revealed by the electron microscope can be applied by any of the physical, chemical, and biological sciences, it must be translated into a form that is of significance to the individual problems being investigated.

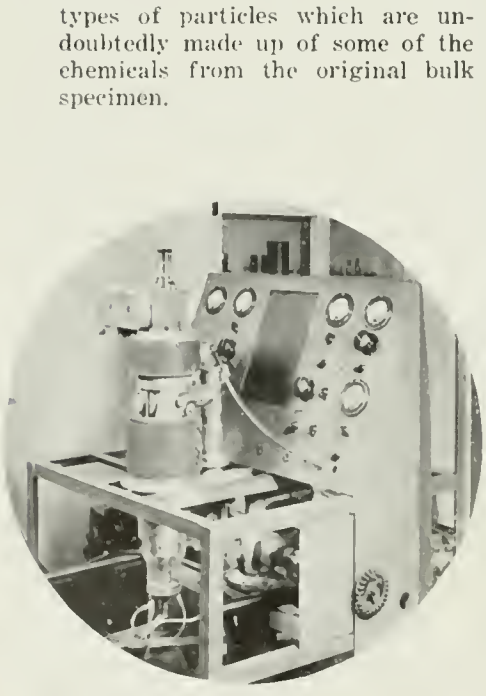
"After looking at an electron micrograph and noting the physical characteristics of the object," he continued, "the scientist invariably asks, 'What is this?' He knows that he had a test tube of a specimen consisting of a number of chemicals, but now he has within his vision a number of different types of particles which are undoubtedly made up of some of the chemicals from the original bulk specimen.

"If the original specimen was a test tube of bacteria, the scientist knew that it consisted of a number of proteins and other organic materials. But on looking at the electron micrograph, he finds that the bacteria have flagella, cell membranes, and structure in their protoplasm which often includes granules and particles surrounding it which he did not know existed. To find out the chemical structure of these particles, he must perform a number of tests on the bacteria. This procedure is very tedious, and not always successful."

At present, the electron micro-analyzer gives elemental and not compound analyses. Dr. Hillier said that he believes further developmental work on the instrument will enable it to show the amounts of each element in a specimen. He sees very little hope, however, of ever being able to show the way in which they are combined.

An incidental development made by Dr. Hillier in designing the micro-analyzer was the improvement of the resolving power of the electron velocity analyzer. Until two years ago, measurement of electron velocities to 1 part in 200 was considered quite good. In the micro-analyzer, Dr. Hillier has used an electron optical trick to remove almost completely any limitations on accuracy. In the experimental model he now has, measurements of 1 part in 4,300 are possible.

Dr. Hillier is one of the nation's youngest and most brilliant scientists, not yet having reached the age of 30. He participated in the design of the first practical electron microscope to be produced in this country—a development directed by Dr. V. K. Zworykin, Associate Research Director of RCA Laboratories. He joined Dr. Zworykin's staff in the late 30's, after doing post-graduate work in electron optics at the University of Toronto.



THIS CLOSE-UP VIEW OF THE ELECTRON MICRO-ANALYZER SHOWS THE DESIGN OF THE MAIN SECTION, TOGETHER WITH THE CONTROL BOARD.

## 30,000 WAR WORKERS LINKED IN YULE PARTY

*Employees In Five RCA Plan Hear Program Simultaneousl David Sarnoff Is Host.*

THIRTY thousand war worke in five eastern and midweste cities were brought together Thur day afternoon, December 23, for Christmas party unique in Amer can industry and, fittingly, the were united through the mediu with which they work—electronic

In a special closed circuit ne work, five manufacturing plants the Radio Corporation of Americ were linked together so that t company's workers in Camden ar Harrison, N. J., Lancaster, Penn Bloomington and Indianapolis, Ind could hear a 15-minute progra which was brought to them at the desks, machines, and benches ov each plant's internal broadcastin system.

David Sarnoff, President of RC was host of the program, whic originated in New York, and whic also included Gladys Swarthou Metropolitan Opera and concer soprano.

Dramatic highspot of the pr gram was a telephone reunion b tween John Pugliese, Camden em ployee representing the thousand of RCA war fathers and mothe with sons and daughters in servic and his war-wounded son, Tony, 2 seaman second class, who was c in from Norfolk, Va. Tony wa badly injured when the destroye on which he was serving attacke a Nazi U-boat. Mr. Pugliese ha two other sons in the armed force one of them a prisoner of war i Germany. In the studio with hi was a fourth son who recently re ceived a medical discharge from th Army and is now also employed a the Camden RCA plant.

Climaxing the party, Mis Swarthout sang "The Lord's Pray er" and led the RCA glee clubs an the unseen audience of workers i all the plants in singing "Silen Night."

As a finale, managers of the fiv plants extended greetings to th other plants.

# HOLLYWOOD AND TELEVISION

*"Bagdad on the Pacific" Is Seen by Strotz as Great Production Center for New Service of Radio Early in the Post-war Period.*



By Sidney N. Strotz

*Vice President in Charge of Western Division—NBC, Hollywood, Calif.*

"BAGDAD on the Pacific." That's what the columnists used to call Hollywood before radio came. They would have to strain even their collossal Hollywood imaginations to coin a phrase that would properly describe the show business created by the combination of motion pictures and radio in Southern California.

I don't think I'm going out on a limb when I say that I consider Hollywood the biggest radio production center in the world. NBC alone originates twenty-three top coast-to-coast commercial programs from Hollywood Radio City. Of the top fifteen programs in the country, Hollywood originates twelve. Of these, ten are on NBC. Their ten combined Crossley ratings represent an aggregate listening audience of a quarter billion people.

In addition to this tremendous volume of commercial programs which Hollywood talent is turning out, nearly every special program produced by the War Department for men overseas is put together and recorded on the West Coast. To meet the requirements of the servicemen overseas, the Special Services branch of the War Department currently is making some 1,200 records a week for distribution to its overseas stations. This supplements a regular short wave schedule of our entire commercial list to all corners of the world. Such is a quick picture of Hollywood production today.

The reason for this concentration of radio production in Hollywood, with its fabulous world influence, obviously is the concentration of talent on the West Coast. This is of great significance to the future of both radio and television.

On the radio side of the picture, I can see a great post-war expansion in the international field. The programs that are going overseas today can't help being heard by the civilian populations of foreign countries. Their quality is so far superior to anything those people have been getting that without a doubt they will want to hear American programs again when the war is over. Our American stars are becoming as popular abroad as they are in the United States. They will have a ready audience waiting for them after the war in any country where the English language is understood.

Now, what about television in Hollywood? The same factors that made Hollywood a great radio center will also make it a great television center. I believe that it will be not only wise, but necessary, for NBC to establish television studios in Hollywood as soon as possible after the war, to take advantage of the talent that already has such a tremendous hold on the public.

Every major motion picture studio in Hollywood is already in the television picture, either through research, television planning or actual participation in experimental telecasts. Motion picture technicians are studying keenly the possible relation of their own field to this new medium. Makeup experts are being engaged to study and develop special television makeup. One of the biggest studios has set up a special department of television to lay the groundwork and provide an organization for the time when the end of the war will make television operations practical.

This makes it obvious that we in the radio industry will have to keep on our toes to stay in a position of television leadership. From NBC's standpoint, I feel that we are doing this. In Hollywood, we already have the site for television studios on the Sunset and Vine property which also houses our broadcasting studios. It's interesting, and perhaps symbolic, that this site is the same one that cradled the motion picture industry some twenty-five years ago. On it was located the old Famous Players-Lasky lot, where such performers as Mary Pickford made their first pictures.

We are ready to begin building our television studios and transmitters as soon as the war is over, and building materials are available. I know that plans for such construction are already under consideration in New York by Niles Trammell, President of NBC, and other officials.

Hollywood is an ideal spot for television production, because it is the only place in America that has so many competent technicians who are familiar with both motion picture and radio production. I have no doubt that film will be used extensively in the technique of television. I don't think there is enough talent in the world to supply the demand that would have to be met if all television entertainment were put on a live basis. Rehearsal hours, memorizing lines and staging live productions, to say nothing of the mechanical factors like sets and scenery, would make it a formidable if not impossible problem. I believe that television production will have to embody both live shows, such as special broadcasts of news and sporting events, and entertainment previously put on film, as the motion picture studios are doing today.

Anyway we look at it, Hollywood is bound to increase in importance as a center of both radio and television, unless some great cataclysm wipes out both the motion picture industry and the climate that has lured so many of our stars into taking Greeley's advice. I for one will bet that "Bagdad on the Pacific" will be here for a long time to come.



AIR COMMODORE C. P. BROWN, BRIGADIER GENERAL H. M. MC CLELLAND, AIR COMMODORE A. F. LANG, BRIGADIER H. M. PATERSON, CAPT. T. A. SOLBERG, CAPT. G. F. BURGHARD, AT RCA LUNCHEON.



CAPTAIN T. A. SOLBERG, COMMANDER FREDERI
ERSON, BRIGADIER GENERAL H. M. MC CLELL
ADMIRAL JULIUS A. FURER, CAPTAIN G. F. BUR
AND AI



O. B. HANSON, VICE PRESIDENT OF NBC, IN CONVERSATION (ABOVE) WITH BRIGADIER GENERAL H. M. MC CLELLAND.

# British Technica

A HIGH British technical mission, headed by Sir
Watson-Watt, outstanding English inventor, and a s
group of United States officials, headed by Dr. Karl T. Co
visited the Radio Corporation of America in New York on N
ber 30 and the RCA Laboratories at Princeton, N. J., on Dec
2. In New York, the groups were luncheon guests of
Sarnoff, President of RCA.

With Sir Robert in the British group were: Captain
Burghard, Brigadier H. M. Paterson, Air Commodore
Brown, CBE, DFC, Dr. C. E. Horton, Professor J. D. Coc
FRS, Dr. W. B. Lewis, Brigadier F. C. Wallace, Group C

CAPTAIN G. F. BURGHARD, SIR ROBERT WATSON-WATT, AND OTTO S. SCHAIRER AT LUNCHEON AT RCA LABORATORIES.





H. H. BEVERAGE, ASSOCIATE RESEARCH DIRECTOR, RCA LABOR
TORIES, DR. KARL T. COMPTON, AIR COMMODORE C. P. BROW



, AIR COMMODORE A. F. LANG, BRIGADIER H. M. PAT-
BERT WATSON-WATT, COLONEL DAVID SARNOFF, REAR
ADMIRAL JOSEPH R. REDMAN, DR. KARL T. COMPTON,
C. P. BROWN.



BRIGADIER GENERAL H. M. MC CLELLAN
COLONEL DAVID SARNOFF, SIR ROBE
WATSON-WATT, AND DR. KARL T. COM
TON AT RCA LUNCHEON IN NEW YOR

# lission Visits RCA

D. H. Johnson, Lieutenant Colonel A. J. M. Fisher, BAS, and Mrs. Allison Munro, secretary to Sir Robert.

With Dr. Compton, a member of the National Defense Research Council, in the American group were: Dr. Lee A. DuBridge, Rear Admiral Joseph R. Redman, Rear Admiral Julius A. Furer, Commander Frederick R. Furth, Brigadier General H. M. McClelland, Colonel T. C. Rives, Colonel J. J. Downing, Lieutenant Commander H. L. Vanderford, Captain T. A. Solberg, and J. H. Teeter.

Otto S. Schairer, Vice President in Charge of RCA Laboratories, was host to the two groups during their visit to the laboratories at Princeton.



COMMANDER FREDERICK R. FURTH AND COMMANDER L. E
BLAYLOCK (ABOVE), DURING LUNCHEON AT RCA LABORATORIES



DR. W. B. LEWIS, L. F. JONES OF RCA VICTOR, AND F. R. DEAKINS,
ALSO OF RCA VICTOR, CAMDEN, AT PRINCETON LUNCHEON.

CAPTAIN T. A. SOLBERG, BRIGADIER H. M. PATERSON, AN
MEADE BRUNET OF RCA VICTOR, WASHINGTON, D. C.



# New Trend In Industry Training

*BROAD, VERSATILE EDUCATION PROGRAMS DEVELOPED FOR EMPLOYEES AS WAR MEASURE PROMISE TO CONTINUE IN PEACE TIME — RCA VICTOR OFFERS FLEXIBLE SCHEDULE TO LARGE GROUPS*



By R. C. Maslin

*Personnel Director,*
*RCA Victor Division,*
*Camden, N. J.*

THERE are many new trends and developments in American life which, born of wartime necessity, promise not only to help win the war but also to continue as a beneficent influence in the post-war world. One of the most significant is the development of a new force in education—the broad, versatile, and flexible training programs being conducted by American industry.

Engendered by the desperate need for skilled production personnel, this highly constructive offspring of the manpower problem is essentially a complement and not a competitor of the more formal programs of technical training and liberal education offered by this country's institutions of learning.

The scope of the training and education program of the RCA Victor Division is exemplified by activities at the Camden, N. J. plant where about 18,000 employees in the last three years have received specialized training through a variety of organized courses ranging from two to twenty weeks' duration.

Although it was not until May, 1941, that a definite need for organized job training became apparent at RCA Victor, the company has maintained from its inception a limited training program consistent with its established policy of upgrading of employees and promotion to fill vacancies from within.

In 1936, training for selected student engineers which had long been given by the company, was formalized and outstanding graduates received internships of up to two years, affording them an opportunity to learn every phase of the business. After-hour classes, held for several years prior to 1936 and at first designed only for the student engineers, were expanded to permit other qualified employees to enter.

Later, when war became imminent, the size of the engineering study groups was increased and the training made more specific. Its objective was the quickest possible preparation for maximum effective war production. Training on the job, under expert scientists and engineers, was intensified.

Plant-wide coordination of the entire training program was achieved last April with the appointment of George A. Mattson to the new post of Director of Education and Training for the Camden plant. Before coming to RCA, Mr. Mattson was engaged for seventeen years in the field of education and training, serving various institutions in the roles of instructor, supervisor, and administrator. From 1940 until April, 1943, he was supervisor of the war production training program of the Camden County Vocational School.

RCA's program now embraces eight distinct types of training, includes courses in more than 60 subjects, and utilizes the cooperative



GEORGE A. MATTSON (LEFT), DIRECTOR OF EDUCATION AND TRAINING AT RCA VICTOR'S CAMDEN PLANT. SCORES OF MEN AND WOMEN ATTEND RCA CLASSES (BELOW) TO BE TAUGHT NEW INDUSTRIAL SKILLS.



services and facilities of seven outside educational institutions in the Philadelphia-Camden area.

Vestibule training, conducted in classrooms in the plant, is used to develop work habits and operational skills which are pre-requisite to work done on a production basis. The term may range from two to six weeks, depending on subject matter, educational background and aptitude of the trainee, and production needs. The eight-hour day is divided into six and one-half hours of operational activities and one and one-half hours of related work in the classroom. During the 1942-43 season, 1,239 men and women studied crimping and soldering, wiring, and assembly in these classes, and 12 women studied engineering drafting.

On-the-job training, which is the type predominantly used at RCA Victor, has been given to thousands of employees since its beginning in 1941. In this program, needed skill is acquired through work experienced on a given machine or assembly line while related instruction is made available through the assignment of qualified instructors. While working on the machine or assembly line, the trainee is at all times under the guidance and direction of skilled mechanics as job trainers.

Departmental training, or "during hours" training, is similar to and supplements the plant-wide plan of on-the-job training, but is distinguished by the fact that it is coordinated through department heads to meet specific needs of their respective employees. Under this phase of the program, 5,135 employees have received classroom training during working hours since 1941.

Courses offered under the heading of "job instruction training" are made available to supervisors and foremen through the Training Within Industry service of the War Manpower Commission and the State Board for Vocational Education.

A yearly enrollment of 560 foremen and supervisors participate in a foreman conference program, under the immediate supervision of three conference leaders who meet regularly each week with scheduled study groups. Materials for discussion, prepared by the conference leaders under the supervision of the educational director and reviewed by a management committee on labor relations, are based on (1) needs for instruction in and clarification of company policies; (2) needs for creation and improvement of techniques for the development of departmental and interdepartmental coordination and good working relations; and, (3) general ideas, opinions, and questions presented by members of the conference groups.



"LEARNING BY DOING" UNDER THE SUPERVISION OF SKILLED INSTRUCTORS. THESE WOMEN ARE BEING TRAINED IN A "VESTIBULE SCHOOL" AT RCA VICTOR'S CAMDEN PLANT.

### *After-hour Classes*

Progressing to the more formal types of training, the RCA Victor program offers a four-year period of training for apprentices in tool making. Each year the company inducts into this apprenticeship program eight to ten young men, usually high school or vocational school graduates, who are placed under the immediate supervision of the department head. The training at present consists of eight hours of shop practice or work experience daily and two evenings of class work each week at the Camden County Vocational School. The class work includes such subjects as blueprint reading, mechanical drafting, mathematics and science. In addition to developing skills needed for craftsmanship, the apprenticeship program recognizes the importance of developing responsibility, self-reliance, appreciation of growth and achievement, and other personal qualities.

After-hour classes, in which a total of about 5,000 RCA Victor employees have been enrolled through 1941, 1942 and 1943, are designed to assist employees (especially those in professional, semi-professional, technical, and semi-technical occupations) in terms of increased efficiency and skill, either for their present positions or to prepare them for upgrading to positions of greater responsibility. They include courses in forty subjects sponsored and financed by the U. S. Office of Education under its Engineering, Science and Management War Training Program, and courses in ten additional subjects sponsored and financed by the company.

Although physical facilities and faculty supervision of cooperating colleges and universities in the Philadelphia area are utilized in

the E.S.M.W.T. courses, the majority of the instructors engaged in teaching these classes, as well as all instructors for the company-sponsored after-hour courses, are RCA employees who have demonstrated required qualifications.

Perhaps the most significant and unusual of the numerous educational opportunities afforded RCA Victor employees by the company is the tuition loan and refund plan, under which 1,107 men and women workers have enrolled in various schools and universities in the Philadelphia-Camden district since the inauguration of the plan in 1941.

Employees who qualify may matriculate at any recognized college, university, or engineering school in the Philadelphia metropolitan area, in courses directly related to the work in which they are engaged, borrowing the cost of tuition from the company and repaying it in monthly installments out of salary. An employee presenting evidence that all course requirements have been satisfactorily completed is reimbursed by the company for a substantial portion of the tuition, depending on the grade obtained. These refunds are scaled at 90 per cent of the tuition cost for a grade of "A," 60 per cent of the tuition cost for a grade of "B," and 40 per cent for a grade of "C." This provides a strong incentive to strive for a higher grade.

Under this plan, employees are now enrolled in electrical and mechanical engineering at the University of Pennsylvania and Drexel Institute of Technology, in business administration at the University of Pennsylvania, Temple University, and the Gibson Institute of Accounting, and in languages at the Berlitz School of Languages and the Philadelphia Academy of Modern Languages.

New educational services just being introduced at RCA Victor to meet needs indicated by recent experience are a conference program for junior engineers and junior executives, designed to encourage their participation and advancement in the company's activities and to provide a medium for the exchange of ideas and pooling of their training and experience, and a specialized 192-hour course to faciliate upgrading of employees for supervisory posts.

Alert to recognize and meet new needs as they arise, the Education and Training Department has kept the program sufficiently flexible to allow for such additions and changes whenever it appears that they will serve the purpose of providing properly trained personnel when and where needed, getting and keeping the right employee in the right job, and encouraging and utilizing the best capacities of all employees.

HAVING COMPLETED A COURSE IN SUPERVISION, NELLIE KNOTTS RECEIVES A CERTIFICATE FROM WALTER GROEBER, MANAGER OF THE CRYSTAL MANUFACTURING DEPARTMENT AT RCA VICTOR, CAMDEN.



## School of Tomorrow

THE sound system will be as familiar in the school of tomorrow as the pot-bellied coal stove of "the little red schoolhouse" era and the time-honored blackboard of present-day classrooms.

That's the prediction of the Educational Department of the RCA Victor Division, Radio Corporation of America, as expressed in a recently published brochure, "Planning Tomorrow's Schools."

Outlining postwar suggestions to the nation's educators, the booklet points out new developments in audio-visual education.

The school sound system, already adopted by thousands of schools and expected to be even more widely utilized in the future, provides a quick, easy distribution of radio programs, phonograph recordings and on-the-spot vocals, as well as serving as a time-saving communication center for the school administrator. Public address equipment likewise can be employed to advantage in the school auditorium, gymnasium or athletic stadium.

As for visual aids, RCA research is reported to be developing improved motion picture projectors for classrooms and auditoriums. The Electron Microscope will be made available to schools and colleges throughout the country. Up-to-date test and demonstration equipment can be installed in science laboratories.

Electronics should play an important part in everyday life in the postwar period—in the home, the school, business and industry. RCA now is developing test equipment and special electronic apparatus for instructional purposes in training postwar students to cope with these advances in the world of science.





IN ITALY, NILES TRAMMELL AND LIEUT. GEN. MARK CLARK VISIT THE WOUNDED IN A FIELD TENT (TOP LEFT); GENERAL CLARK AND TRAMMELL INSPECT A "LONG TOM" (TOP RIGHT) ON THE BATTLE FRONT NORTH OF NAPLES; GENERAL CLARK, AIR VICE-MARSHALL MAC NEECE FOSTER OF THE JOINT COMMAND, TRAMMELL AND FIELD OFFICERS (RIGHT) STUDY MAP.

# NBC Heads Visit Fronts

## *TRAMMELL AND ROYAL, AFTER TRIP TO EUROPEAN THEATERS, PLAN INCREASED NEWSCASTS TO U. S. SOLDIERS OVER SEAS*

By Niles Trammell

*President,*
*National Broadcasting Company*

A TRAVELER in the battle-scarred war-fronts brings some poignant memories that time can never erase. With that John Royal, NBC vice-president in charge of international relations, who accompanied me on a recent six-weeks visit to England and the Mediterranean, will agree.

We saw much that was inspiring, much that was grim. We saw the perfect discipline of our American troops, a discipline comparable to that of the finest European armies, yet withal tempered by an understanding and camaraderie between officers and men. We saw the ebullient, rowdy, irrepressible sense of humor of the American soldier, a sense of humor that never fails him, not even when the going is toughest. We saw America transplanted to strange and foreign soil but still the same America.

We saw General Clark at the front talking to the soldiers. He would get out of the vehicle, walk up to the men, and make inquiry regarding their food and general welfare. He knew everything that was going on at their front and kept informed of troop movements from hour to hour.

German prisoners, according to our boys, are morose; Italians seem to be glad the fighting is over. In one of the fighting sectors we visited in Italy, the German prisoners we saw were about 15 or 16 years of age. A few may have been a little older but the rest looked like high-school sophomores. The Germans were still tough, our boys say, and it is going to be a long time before the end of the war will be in sight.

The American soldier thinks the British Tommy is a great soldier, a good guy to know. There is a healthy competitive spirit between the Americans and British, out of which has come a deep respect for the British Tommy. In England, our boys have earned the good-will of everybody.

Our soldiers want more news from home — newspapers, maga-





JOHN ROYAL, TRAMMELL, AND GENERAL CLARK (ABOVE) SEE ENEMY'S POSITION ON MAP; WITH GENERAL CLARK IN THE LEAD, TRAMMELL AND ROYAL STRIDE ALONG AN ITALIAN ROAD (BELOW) DURING TOUR OF FRONT LINES.



zines, and radio news broadcasts. At the present time, they have a great deal of difficulty hearing our short-wave broadcasts.

In Tunis, Algiers, and other centers, the Army operates low-powered radio stations which send out recorded broadcasts of all our popular American programs — Bob Hope, Fibber McGee and Molly, Kate Smith, Fred Waring, and the others. The real complaint among the boys is that they don't get enough news about happenings on the home front.

These complaints will be ironed out. We feel certain that the various agencies of the government concerned with the upkeep of the morale of our soldiers will do their utmost to improve this important matter of supplying news overseas. We have several plans to correct these shortcomings and we intend to discuss them with government officials.

Both the newspaper and radio correspondents on the fighting fronts are doing a great job, in my opinion. Our correspondents have done superb work in giving factual accounts of the successes of the troops. But they haven't personalized the war as I think it can be done and as these generals want it done. For instance, when some Johnny Doughboy single-handedly takes a machinegun nest and permits some platoon to occupy a high place as a result of his activities, there ought to be some credit given that particular kid. At present nothing is being done to bring home to the American public the accomplishments of the boys who are bearing the brunt of the fighting.

It was inevitable that this trip should have some effect on our post-war planning and we have come to the conclusion that after the war there must be an organization, representing the free countries, whose sole mission it will be to see that radio henceforth shall be used for good instead of evil.

Radio must no longer be an instrument for propaganda. It must become a free medium for mass communication — entertaining, instructing, but never warping the minds and souls of people as it did in Italy and Germany.



GEORGE K. THROCKMORTON (LEFT), RETIRING VICE PRESIDENT AND DIRECTOR OF RCA, CONGRATULATES HIS SUCCESSOR, FRANK M. FOLSOM.

# FOLSOM HEADS RCA VICTOR

*Former Chief of Procurement Branch of Navy Succeeds Throckmorton As Vice President and Director of Radio Corporation of America*

FRANK M. FOLSOM, Chief of the Procurement Branch of the Navy Department, was elected a Vice-President and a Director of Radio Corporation of America on December 4, David Sarnoff, President, announced. Mr. Folsom, who served with the Navy until December 1, will be in charge of the company's manufacturing division, RCA Victor, with principal plants in six cities and headquarters at Camden, N. J. He assumed his new duties January 1. Mr. Folsom was born in Sprague, Washington, and is 49 years of age.

Mr. Sarnoff also announced that the Board had accepted with regret the resignation of George K. Throckmorton as an RCA Vice-President and Director. Mr. Throckmorton, who was head of the RCA Victor Division, is retiring for reasons of health, but will continue as a consultant to the company.

Personal messages to David Sarnoff, from Secretary of the Navy Frank Knox, Under-Secretary of the Navy James Forrestal, and Chairman of the War Production Board, Donald M. Nelson, expressed deep appreciation of the value of Mr. Folsom's services to the Navy.

In commenting on Mr. Folsom's election, Mr. Sarnoff said:

"The operations of the RCA Victor Division, with its large plants and many thousands of employees, involve the design and manufacture of important war production assignments for the Navy, Army, Air Forces and Maritime Commission. These assignments call for leadership, experience and ability of the highest order. The need for a man of unusual qualifications is enhanced by the prospect of our post-war manufacturing activities in radio, television, electronics, phonograph records and allied fields. Recognizing the problems of full scale war production, as well as post-war conversion and the expanded role distribution will need to play to provide maximum employment, we feel the company is extremely fortunate in its choice of Mr. Folsom."

# Television Expansion Foreseen

*WITH EXPECTED PRODUCTION OF $200 HOME RECEIVER, NEW SERVICE WILL EXTEND TO 152 KEY CITIES OF U. S. WITHIN FIVE YEARS AFTER WAR, REACH 60% OF NATION'S PEOPLE, JOYCE BELIEVES*

WITHIN five years after commercial resumption of television, sight and sound programs, broadcast by network and individual stations in 157 key cities, will be available to 60 percent of the people of the United States if the radio industry can produce a television home receiver priced at approximately $200.

This was forecast by Thomas F. Joyce, Manager of the Radio, Phonograph and Television Department of the Radio Corporation of America, speaking recently before a joint meeting of the American Television Society and the Advertising Club of New York.

"Such a receiver, I believe, is possible," he said, "based on 1940 labor and material costs, and assuming no excise taxes. Of course, the postwar price would be increased by the factors of inflation and excise taxes."

In a clear-cut analysis of postwar television markets, marked by a strict adherence to practicalities and known facts, Mr. Joyce declared that the number one problem of the postwar television industry was an acceptable low cost radio television receiver. He cited an 11-city survey which showed that more than 61 per cent of men and women questioned said they would buy a good television receiver priced at $200.

Within ten years after full commercialization of visual broadcasting, Mr. Joyce declared, television will be a billion dollar industry. This, he said, is based on the development of a low cost automatic rebroadcasting television transmitter to relay programs in areas outside the scope of the key network stations.

"Such a development will make it economically feasible to bring television service to practically every home in the United States," he said, adding that at that time retail billing of television sales should be between six and seven hundred million dollars.

"This billing," the RCA executive stated, "together with replacement tubes for existing receivers, service, transmitter sales, advertising revenue, and other items, will make television the billion dollar industry that many have prophesied it will be."

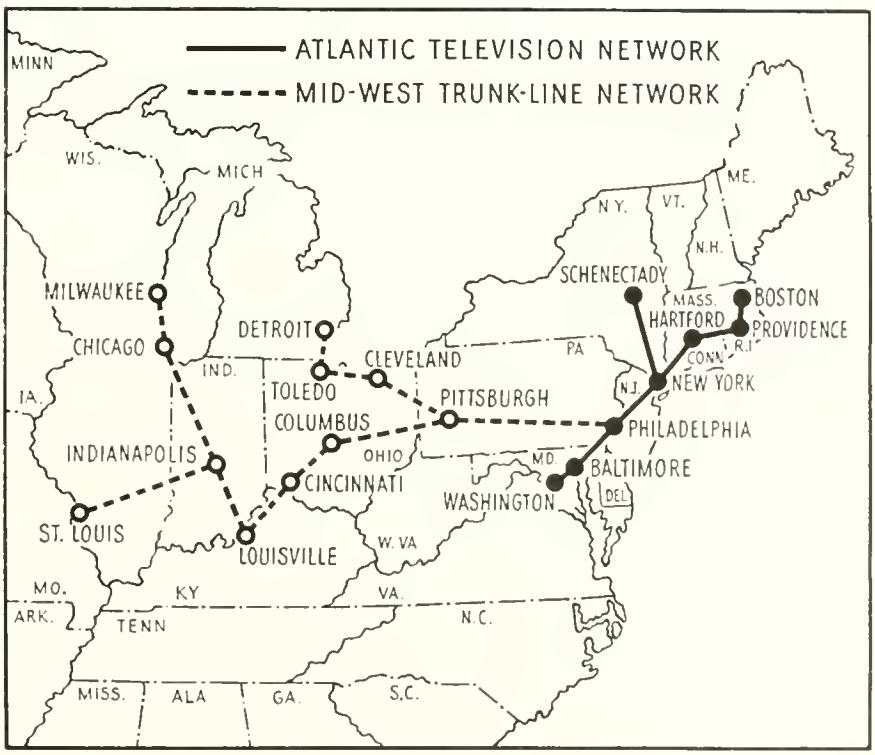
In presenting this picture of the postwar television market, however, Mr. Joyce warned against any radical changes in standards that would make the $200 television receiver improbable, at least for the immediate postwar period.

His estimates on the probable postwar rate of market development for television, he explained, is based on a complete agreement on standards approved by the Federal Communications Commission, which would give the industry the "green light" to go ahead without any "ifs."

"It has been assumed for estimating purposes," he said, "that there will be no changes in the standards or in the place which television occupies in the broadcasting spectrum, which might substantially delay the start of television or bring about more complicated engineering and manufacturing."

The nucleus of a television network has already been started, Mr. Joyce pointed out to the audience of top ranking television experts and advertising executives. Programs

THIS MAP SHOWS A POTENTIAL POST-WAR TELEVISION NETWORK AS PROJECTED BY THOMAS F. JOYCE IN A RECENT ADDRESS IN NEW YORK. SOLID LINES INDICATE AN INITIAL NETWORK, AND THE BROKEN LINES SHOW HOW IT COULD BE EXPANDED.





THESE WOUNDED SAILORS IN THE U. S. NAVAL HOSPITAL AT ST. ALBANS ARE WATCHING ONE OF THE SPECIAL TELEVISION PROGRAMS ARRANGED BY NBC FOR THE RENEFIT OF CONVALESCENT SERVICE MEN IN NEW YORK AREA.

originating at NBC, in New York, are now being broadcast to Philadelphia, New York, and Albany-Schenectady. Television broadcasting facilities also exist in Chicago and Los Angeles. A television station would also begin broadcasting from Cincinnati as soon after the war as equipment became available, Mr. Joyce revealed. These cities would logically be the first television markets, he said.

Mr. Joyce estimated that within two or three years after the full commercialization of television, about 10 per cent of the wired homes in the foregoing cities, or 741,000 families, representing a probable audience of 7,000,000 persons would own television receivers.

"We can assume further," he continued, "that within three or four years after commercial resumption of television, Washington, D. C., Baltimore, Hartford, Providence, and Boston will have television transmitters. These cities, together with Philadelphia, New York, Schenectady and Albany, could be interconnected with a television network circuit about 600 miles long.

"This network circuit would make television broadcasting service available to 33,336,000 people, 9,379,039 wired homes, representing 36.62% of the total U. S. buying power."

The RCA executive then went on to describe the development of the television network by trunk lines, thus linking the middle west with the Atlantic seaboard, bringing television service to Pittsburgh, Cleveland, Cincinnati, Detroit, Chicago, St. Louis, and Milwaukee.

This trunk line television network, with the secondary networks that would be off-shoots from it, he said, can be expected to develop approximately five years after the full commercialization of television.

By the end of the fifth year, he said, engineers should be able to develop the automatic transmitter for rebroadcasting television programs, thus blanketing areas of the country unreached by the stations in the 157 key cities.

Mr. Joyce also took occasion to remind his audience that it was too much to expect television to spring forward as an industry the day the fighting ceases.

"It may be a year, or two or three years after the war before television is ready to go forward on a commercial basis," he iterated. "That depends upon the character of the recommendations made by the Radio Technical Planning Board and the action taken by the Federal Communications Commission on the recommendations by that Board. Of this, though, we may be certain: that the generations that come after the war will take home television service just as much for granted as the present generation takes radio."

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MAJOR sports events and other spectacles held in Madison Square Garden are being televised by the National Broadcasting Company for the enjoyment of wounded soldiers and sailors in hospitals in the New York area.

Plans for this new television service, arranged in cooperation with Army and Navy medical authorities, were announced recently by John F. Royal, NBC vice-president in charge of International Relations, Television and Short-Wave. John T. Williams, NBC's Manager of Television, is in charge of the project.

Television receivers have been installed by the National Broadcasting Company in the Halloran General Hospital, Staten Island, U. S. Naval Hospital, St. Albans, N. Y., the Tilden General Hospital at Fort Dix, the Naval Hospital at the Brooklyn Navy Yard, the U. S. Navy Convalescent Hospital at Harriman, N. Y., and one other institution.

The first television program for the wounded men, over NBC station WNBT, was the rodeo direct from Madison Square Garden on Monday evening, October 25.

Under arrangements made with Ned Irish, manager of Madison Square Garden, NBC plans to televise track meets, basketball and hockey games and other sports events originating at the Garden from time to time.

Arrangements were completed by Royal and Williams with Col. C. M. Walson, of the Medical Corps, Second Service Command, and Lieutenant Willard B. Stone, USNR, District Welfare-Recreation Officer.

The television area reached by the programs for the wounded men will extend approximately 75 miles from Radio City, with re-broadcasts through WPTZ, Philadelphia, and WRGB in Schenectady, N. Y.

At least one receiver has been installed in each hospital. As many more instruments will be installed as NBC is able to obtain.

## Music Aids Production

Selected music in high-geared war industries lifts workers' morale, reduces fatigue and is a definite aid to production.

That's the word from War Production Drive Headquarters following an extensive survey of 100 war plants, undertaken for the WPB by Wheeler Beckett, well-known conductor and composer.

# LARGER TELEVISION IMAGES

*RCA Scientists Solve Difficult Optical Problems in Projection—Develop Methods of Molding Plastic Lenses for Both Home and Theater Receivers.*



By I. G. Maloff

*RCA Victor Division, Camden, N. J.*

IMAGE size in television—for either the theater or the home—is no longer a serious problem in engineering or economics.

It is possible to build, as was demonstrated experimentally by RCA just prior to the United States' entrance into the war, projection-type television receivers that reproduce images of any desired size up to full theater-screen dimensions.

Not generally known, however, is the story of how certain features of one of the great instruments of astronomy — the Schmidt-Kellner camera—were adapted to television projection. The story concerns behind-the-scenes laboratory work, calling first for the solution of an unusually difficult mathematical problem in optical design, and finally, for development of a method to reduce the production cycle of a new lens from months to minutes.

To those who have seen the all-electronic system of television in operation, it is well-known that images received from a television transmitter are reproduced on the broad, nearly-flat end of a tube called the kinescope. The kinescope can be built in various sizes, but when it is given a diameter much larger than 12 inches the cabinet in which it and its accompanying equipment are housed becomes undesirably bulky for practical home use.

For this reason, it was apparent some years ago that if larger television images were to be available in homes, a system of optical projection must be developed. Tests with standard projection optics produced screen images that were much too dim for practical use. Thus, the situation called for a new approach—an original conception.

It had been known for a long time that aspherical* lenses in combination with either spherical or aspherical mirrors may be arranged into optical systems of high definition combined with great light gathering power. Astronomers were first in making use of this principle, especially in an arrangement consisting of one spherical mirror and one aspherical lens. The high costs and difficulties in constructing aspherical lenses retarded more general utilization of such systems.

### *Conceives New System*

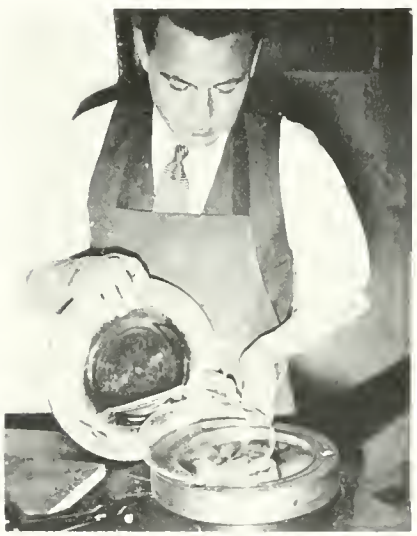
Quite a few years ago, D. O. Landis, an optician working in the laboratories of the RCA Manufacturing Company (now RCA Victor Division), and having contact with the needs and aims of men working on television research, conceived the idea that an optical system could be built using aspherical elements for projection of television images. He realized, too, that the shape of the aspherical lens in his new system would be different from that of the astronomical lens. This, he understood, was because the astronomical camera is focused on infinity but in his case a short and finite distance separated the optical system from the projection screen.

Landis submitted his idea to E. W. Engstrom, now Research Director of the RCA Laboratories (then heading the Research Division of RCA Manufacturing Company at Camden, New Jersey) and was encouraged to construct a working model. It may be mentioned here that Mr. Engstrom's action was not in accord with the more conservative opinions of some members of his staff at the time Landis commenced his work. The design of aspherical infinite focus systems seemed to offer little assistance to the evolution of aspherical finite focus projection systems.

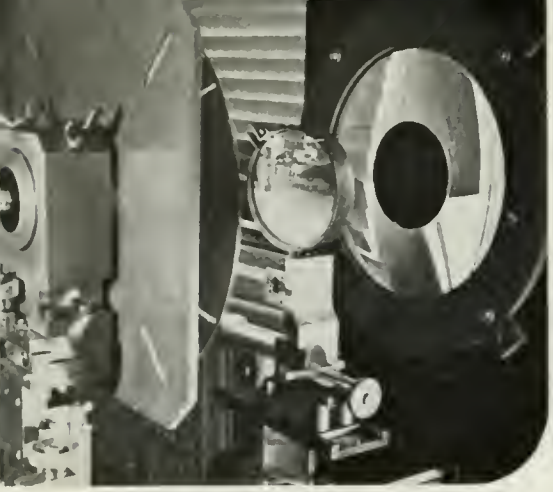
Landis went ahead struggling with his system and doing most of the work in the basement of his home, where he had a well equipped optical shop. He was then a well known figure among amateur astronomers as well as among amateur telescope makers. After a few months of long hours at the grinding and polishing machines his first



R. LEUSCHNER TESTS AN ASPHERICAL LENS (ABOVE) FOR DEVIATIONS FROM THEORETICAL DESIGN; THE AUTHOR REMOVES A PLASTIC ASPHERICAL LENS (BELOW) FROM THE MOLD IN WHICH IT WAS MADE.



* Conventional lens design makes use of entirely spherical surfaces; in aspherical lens design, the surface has a variable curvature.





THE GREAT LIGHT-GATHERING POWER OF RCA'S TELEVISION PROJECTION OPTICAL SYSTEM IS DEMONSTRATED IN A SET-UP (LEFT), WHICH SHOWS THE BRIGHT IMAGE OF THE PHILADELPHIA SKYLINE, INVERTED IN THE CENTER LENS, UNDESTROYED BY FULL DAYLIGHT ILLUMINATION. A PHENOMENON OF THE SYSTEM IS A "GHOST" IMAGE (RIGHT), WHICH APPEARS IN THE AIR ABOUT TWO FEET AWAY WHEN A SMALL ORJECT IS SUSPENDED IMMEDIATELY IN FRONT OF THE SPHERICAL MIRROR. THE "GHOST" IN THIS CASE IS AN RCA LAPEL EMBLEM.

aspherical system, for projecting television images from cathode-ray tubes onto a viewing screen, was ready; special tubes were built for it, and the first demonstration was given at the Camden laboratory.

Research engineers viewing the demonstration were astounded by the brightness of the projected picture but, while the definition of the system seemed nearly satisfactory for the quality of the picture then transmitted, it was not high enough for the pictures planned for the immediate future. Mr. Engstrom then assigned a number of engineers to the many problems connected with producing aspherical reflective projection systems of high light gathering power, high contrast, and high definition. Two immediate applications seemed obvious: first, a theater television system for pictures about 15 by 20 feet, and second, a home television system with pictures around 15 by 20 inches in size.

The new engineering group tackled the problem from many angles, theoretical as well as practical, and the results were very gratifying. The first public showing of a theater-television system was made by the Radio Corporation of America when it demonstrated at its annual stockholders' meeting in New York City on May 7, 1940, a projected-television picture 4½ by 6 feet in size with a high-light brightness well above the 5 foot-lambert value. The demonstration was given before some 300 stockholders and press representatives. The same system was shown informally to members of the FCC on February 5, 1940, in Camden, N. J. The optical system used in these demonstrations had been completed long before the demonstration. Landis applied for his patent (U.S. No. 2,273,801, now granted) in 1938.

The next step was to build a system for a full-size theater screen. This was done and on May 9, 1941 a demonstration of such a system, using a 441-line television signal and a projection screen 15 by 20 feet, was formally given before a large group of invited guests. The demonstration was held in the New Yorker Theater, 254 West 54th Street, New York City. The program included dramatic sketches from the NBC studios, Lowell Thomas, a singer, and was climaxed with a championship boxing bout. Previous to the formal May demonstration, one was held in the same theater on January 24, 1941 for members of the FCC and the press.

Among several workers, besides Landis, whose efforts contributed to the improved optical systems used in these demonstrations were E. G. Ramberg and D. W. Epstein, who worked out the theory of the finite-throw systems and produced practical designs; also, R. Leuschner, whose skill in working glass surfaces saved much time and effort.

### *System Highly Efficient*

In the system demonstrated in New York, a scene transmitted from a studio is reconstructed as a picture on the curved wide end of a cathode-ray tube about 7 inches in diameter. This picture is very brilliant, but small. The spherical mirror, 30 inches in diameter, gathers the light emanating from the tube and reflects it through a 22½-inch lens on the theater screen. This screen is the regular motion picture screen. All the light (except for slight losses in reflection and transmission), which the large mirror gathered, finds its way to the screen, and this accounts for the superiority of the new optical system over conventional projection lenses.

While a great deal of effort was being devoted to the theater television, the home-projection television receiver was getting as much attention if not as much publicity. Optical systems for home projection were being built, tested, rebuilt, improved and tested again. The same result as with the theater-size equipment was obtained with living-room-size pictures, namely: a large gain in light with ample resolution and contrast.

The major obstacle to the use of reflective optical systems in projection television receivers for the home has been the high cost of the aspherical lens. The spherical mirror while quite large, ten inches in diameter and more, is an old familiar item to the 150-year-old optical industry, since most of the conventional optical surfaces are spherical and are easily made. With the aspherical surface, similar to a figure of revolution of a shallow letter S around one of its ends, the story was different. Such a figure is not a naturally generated surface and there were no machines for the straight forward production of such surfaces. True enough, astronomers, with their traditional patience and lack of hurry, managed to produce excellent aspherical lenses of such type on machines used for making astronomical instruments, but only by a tedious step-by-step method.

This method comprised grinding, polishing and optical testing operation repeated a great many times and at great expense in time and money. While the RCA men succeeded in reducing the number of operations, especially those of optical testing, they were still using the general methods and machines developed by astronomers. Their shortcuts were chiefly due to the fact that they did not need and did not strive for true astronomical accuracies.

The gain in light over the conventional projection lens was very attractive, but the cost of individually produced lenses was prohibitive. The apparent solution to the cost problem was molded aspherical lenses. A development was undertaken, and soon was concentrated on clear transparent plastics known under the complicated name of methyl methacrylate with simpler terms of Plexiglass and Lucite as their trade names.

A new set of difficult problems presented themselves. The manufacturers of plastics lent a willing and helping hand, but they did not know how to mold precision optical elements. The problems of making metal molding surfaces in shapes of negative replicas of aspherical surfaces promised to be formidable. The intensive efforts directed to this problem, however, proved successful, and experimental models of projection television receivers with plastic aspherical lenses were operating in RCA laboratories as early as 1940.

The molding process is essentially that of applying very large pressure to heated plastic material confined in the mold and cooling it under pressure until it reaches room temperature. The mold is then opened, the lens extracted and the hole for the neck of the protruding cathode-ray tube is bored out. The lens is then ready for use, with no polishing or finishing of any sort needed. As a rule, plastic lenses have been found to be of better quality than their glass counterparts, since it is permissible to spend a great deal more time and money on a mold good for, say, 1,000 pieces than on one piece by itself.



# RCA MEN ROVE WAR FRONTS

*Service Engineers, "Unsung Heroes," Install and Maintain Radio-electronic Equipment for Armed Forces at Far-flung Battle Stations—Teach "Know-how."*



By W. L. Jones
*Vice President and General Manager, RCA Service Co., Inc. Camden, N. J.*

HE was on duty at Pearl Harbor the infamous morning of December 7, 1941, when the Japs staged their sneak attack; he's been an island-hopper in the Southwest Pacific; he demonstrated radio "know-how" to our allies in darkest Africa; he moved with Allied forces as they pushed the Germans out of North Africa, out of Sicily and northward into the mountains of Italy.

He doesn't receive military decorations, win medals, march in parades or have his exciting odyssey glamorized by Hollywood, but you will find him in the Aleutians, on Guadalcanal or with Uncle Sam's fighting men on other far-flung war fronts.

His only reward—and the only reward he desires—is the sheer satisfaction of knowing he's doing his part in the battle against the Axis.

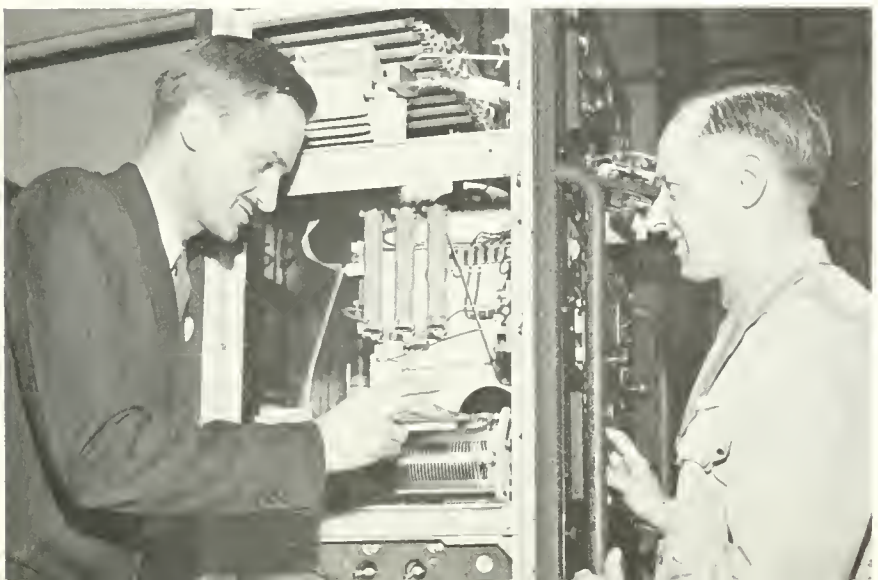
He is the unsung, unassuming civilian field engineer assigned to the Navy by the RCA Service Company to install and service RCA electronic equipment for the armed forces, and to give instruction on operation and maintenance.

After months of high-geared activity at far-off battle stations, the RCA engineer is called home long enough to brush up on new developments in radio and electronics. Then he stands by in readiness for his next assignment.

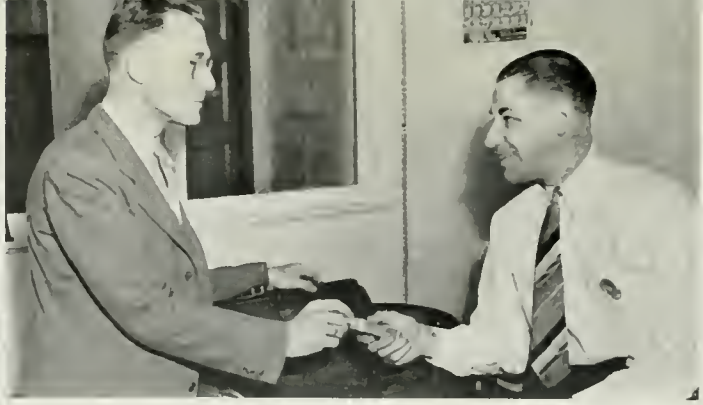
Frank Hartwick, recently back from Guadalcanal and nearby islands, has won the sobriquet of "circuit rider of the Southwest Pacific." Called by the Navy from Pearl Harbor on what apparently was a short emergency assignment, he was given a roving commission to go from one island to another, wherever he thought he was most needed and could do the most good.

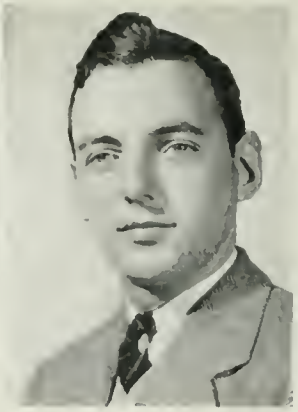
Riding herd on the complicated equipment which is the voice, the eyes and the ears of the armed

BATTLEFRONT ENGINEERS MERRILL CHAPIN (LEFT) RACK FROM THE ALEUTIANS, AND FRANK HARTWICK, "CIRCUIT RIDER OF THE SOUTHWEST PACIFIC," INSPECT A RADIO TRANSMITTER AT THE RCA CAMDEN PLANT.









E. D. VAN DUYNE (LEFT) SPENT SIX MONTHS IN THE CARIBBEAN; GODFREY RENDELL (LEFT ABOVE) IS GREETED ON HIS RETURN FROM IRELAND BY W. J. ZAUN; AND W. W. BUTLER (RIGHT), WHO SERVED IN AUSTRALIA.

forces in modern warfare, Hartwick flew more than 100,000 airline miles during a year in the Pacific.

Although more or less stoical about "the bomb or bullet that has your name on it," Hartwick nevertheless acquired an automatic reaction of diving for cover when bombs started blasting around him or when a Zero came in low with machine guns blazing.

From another Pacific outpost — sandy Midway Island, 1,100 miles beyond Honolulu — came Edward Edison several weeks ago. Edison, who was the only civilian on Midway when he arrived there, found time between installations and service assignments to make several flights in Navy patrol planes and to go along on sea runs to see electronic equipment in actual use.

The only "natives" of Midway, according to Edison, are the gooney bird, whose call is a ringer for the Bronx cheer; the moaning bird, which gives a spine-chilling imitation of a man who has been stabbed in the back; and brightly-colored little canaries, whose pleasant notes help compensate for the raucous cries of the goonies and moaners. This, however, is little enough musical entertainment for Navy personnel stationed on Midway, so practically every man there has his own radio or phonograph. Several hundred RCA 5-tube sets are helping keep the boys in good spirits, and swapping phonograph records is one of the favorite pastimes of the Pacific base, with a surprisingly large number of men putting in quick bids on light classical music of the Victor Red Seal type.

Edison, recently relieved by A. E. Hilderbrand, and Tom Shipferling, just back from Pearl Harbor, relate how American boys in the Pacific listen, via short wave, with mingled amusement and contempt to "Tokyo Rose," an American-educated Japanese woman announcer who mixes American swing with Jap propaganda. The lads get a kick out of the music, but laugh up their GI sleeves when "Tokyo Rose" starts her usual patter urging the boys to forget all about the war and go home.

"After all, we Japanese have nothing against you boys," she coos, "and certainly you have no reason to dislike us." The invariable reply to this chatter is a jeering "Oh, yeah?"

When the Japs struck at Pearl Harbor two years ago, RCA's Merrill Gander was on a ferryboat, returning from duty. Other RCA men who followed him to Hawaii include S. E. Baker, R. J. Ehret, T. R. Hays, R. H. Newton, K. C. Heddens and C. A. Hobbs.

### *Two Sent to Iceland*

Elsewhere in the vast Pacific, RCA engineers have been Johnny-on-the-spot when the Navy needed them—such as Merrill F. Chapin, T. H. Flythe and R. W. Connor in the Aleutians, George Jacobs and William Butler in the Australian sector and E. C. Tracy in the Southwest Pacific.

Tracy, a replacement for "circuit rider" Hartwick, is on his second overseas assignment. After receiving from the hand of President Roosevelt a War Production Board "Citation of Production Merit" for a valuable production suggestion, Tracy went with Pryor Watts to Iceland—via Ireland and England.

They flew from Rhode Island to their embarkation point, where they polished off an important installation before joining an Iceland-bound convoy. Long after their ship should have docked in Iceland, they discovered the course had been altered because of a tangle between convoy vessels and enemy submarines. After docking in Ireland, they moved on to London, thence to Iceland, where R. S. Willard was the first RCA engineer envoy.

One of the first RCA service men to go on duty with men in uniform was Fred Lakewitz, of Boston, who had three surprise assignments in quick succession. One night after midnight he was called by the Navy, handed sealed orders and transported to a patrol vessel whose communication equipment needed servicing. Neither his family nor his office knew his whereabouts for the next three days.

On another occasion, Lakewitz was assigned to test electronic equipment on a battle cruiser during a trial run. Expecting to be back at his point of embarkation within a few hours, he left his car at the dock. Several days later he was put ashore at a port 800 miles from his starting point.

But Lakewitz' biggest thrill came when a submarine chaser on which he was testing equipment was ordered into action with three Navy blimps in an effort to run down an enemy submarine that had been sighted. Lakewitz stood "general

quarters" duty, operating communications and other equipment for twelve hours, during which time three contacts were made with the enemy sub—two by blimps and one by the sub-chaser.

Godfrey Rendell was asked to be ready to leave on an hour's notice for a port in the British Isles.

Similarly, Ed Van Duyne, in the midst of holiday preparations last December with his wife and four youngsters in New York, was called on less than 24-hours notice to proceed to an Atlantic coast port for an assignment expected to require from ten days to three weeks. The job was to train crew members on destroyers at sea in the use of RCA equipment.

When he next planted his feet on solid ground, it was on the soil of a Caribbean base, where his services proved so valuable that his assignment was stretched to six months before the Navy agreed to the assignment of another engineer to relieve him. Temporarily a "man without a country" when he returned without passport or other credentials, he finally convinced U. S. Custom authorities of his American citizenship and was permitted to return to his home and family.

Scattered through the Caribbean area are several bases which have been operational locales for such field men as W. W. Gilreath, P. C. McGaughey, C. M. Brown, and others.

Although not actually serving directly with U. S. military forces, two RCA engineers did yeoman work for the cause of the United Nations by penetrating the Congo country of Africa to supervise installation of powerful radio transmitters for our Allies.

To natives of the Belgian Congo, the strange new structure at Leopoldville with its towering antennae is just "singa pamba"—literally translated: "bunch of wires; nothing." To the rest of the world, however it is Radiodiffusion Nationale Belge—the Voice of Free Belgium.

To this far-off outpost of democracy went Welden Shaw to install equipment purchased from RCA by the Belgian National Government. Shaw had the cooperation of veteran Belgian technicians in setting up the 50,000-watt short wave transmitter. Native laborers were not impressed with the significance of the project, but they did their work methodically and well.

Just across the Congo river, where it widens into the Stanley Pool, is the port of Brazzaville, in French Equatorial Africa, among the first French colonies to rally to the cause of General Charles de Gaulle. RCA Engineer Paul C. Brown was in charge of setting up a 50,000-watt transmitter for Radio Brazzaville, which is a beacon of information and inspiration for men and women in temporary bondage in Nazi-occupied French possessions.

Behind these installations on the Dark Continent is a story of men working 12 and 14 hours a day, some fighting fever and all menaced by clouds of malaria-laden mosquitos, with temperatures in the high 90's, humidity 100%.

Foreign lands are no novelty for Brown. From 1935 to 1940 he lived in Saigon, French Indo China, while in business as a distributor for RCA products in the Far East. He left Saigon in October, 1941, joined the service division of RCA and returned to the Camden plant to work on the transmitter destined for Brazzaville.

Throughout the world, there are still other RCA field engineers, wherever and whenever the military requires their counsel and skill in installing, repairing and servicing electronic equipment, and instructing personnel on its use and upkeep. These, for the moment, remain unidentified. One by one they will complete their assignments, be relieved by a fellow engineer long enough for a visit to RCA offices and laboratories, then stand on call, ready for any new assignment.

And so it will go, until the war is won—the unheralded and unpretentious RCA engineer speeding to every corner of the globe to provide a vital link between working men on the production front and fighting men on the battlefront.

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ENGINEER PAUL C. BROWN TAKES LEAVE OF CAPTAIN S. KAGAN OF THE FRENCH COMMITTEE OF NATIONAL LIBERATION IN BRAZZAVILLE, WHERE BROWN SUPERVISED INSTALLATION OF A SHORT-WAVE TRANSMITTER.




ENGINEER BROWN GETS THE HELP OF NATIVES IN PUTTING INTO POSITION THE HUGE TRANSFORMER, WHICH WAS PART OF THE RCA TRANSMITTER INSTALLATION AT BRAZZAVILLE. NO CRANES OR DERRICKS WERE AVAILABLE.






J. FRANCIS HARRIS OF RCAC IS INTERVIEWED FOR NBC LISTENERS BY DICK CONNOLLY ON HIS RETURN TO THE UNITED STATES ABOARD THE DIPLOMATIC EXCHANGE LINER GRIPSHOLM.

# RCA MAN BACK FROM JAPAN

***Communications Representative in China, Japan, and Manchuria Describes Experiences as Prisoner of War Following Return to U. S.***

*Editor's Note.—J. Francis Harris has represented RCA Communications in China, Japan and Manchuria since 1932 and he was the Vice President in charge in that area from 1939 until the outbreak of the war. He was also a Director in the Victor Talking Machine Company of Manchuria, Ltd., and the Victor Talking Machine Company of China, Ltd. On Pearl Harbor Day, in 1941, he was captured by the Japanese in the RCAC offices in Shanghai. When, on December 1, 1943, he returned to the United States aboard the diplomatic exchange liner "Gripsholm," he was asked to describe his experiences for "Radio Age."*

By J. Francis Harris

THE morning of December 8, 1941 at Shanghai (December 7 at Pearl Harbor), is a time I will never forget. About daybreak, there occurred the famous Battle of the Wangpoo in which the Japanese battle cruiser "Idzumo" and numerous shore batteries literally blew the heroic British gunboat "Petrel" out of the water. The captain of the "Petrel" had preferred to go down fighting rather than surrender his almost defenseless little ship.

After helping several of the seriously wounded British sailors who had swum ashore to the French Bund—an endeavor that was explosively interrupted by the arrival of Japanese marines in fighting humor—I proceeded to the RCA Communication offices.

At 4:18 o'clock, a Japanese Imperial Landing Party took over all American institutions in Shanghai. Alone in the office when the Japanese marines marched in, it was obvious to me that RCAC's business in Shanghai was at an end for the duration.

Although a Japanese officer ordered me to stay in the office I was carelessly guarded and managed to destroy a number of papers which seemed important at the time. After two days, the Japanese told me to keep the office open until they had time to complete their investigation and take over. There was nothing to do but obey. I spent the next few months liquidating our Shanghai business.

The RCAC offices in Tokyo, Osaka and Kobe, Japan; the Victor Talking Machine Company of Manchuria, Ltd., at Hsinking; and the Victor Talking Machine Company of China, Ltd., at Shanghai had the same experience as RCAC in Shanghai. They were not closed, but their facilities were taken over by the Japanese.

In January, 1943, I was interned in the Pootung prison camp near Shanghai where about 385 American and 800 British men were held. Chosen Assistant-Representative for the camp, it was my job to negotiate between the interned men and Japanese officials and to assist in the general management of camp affairs.

The Pootung camp is an old tobacco warehouse but we managed to make a fairly livable place out of it, since the internal management of the camp was left largely in our hands. The warehouse comprised three buildings of three floors each. It could probably have accommodated four or five hundred men fairly comfortably—it actually held about 1,200. In my room, eighty men were crowded into space sufficient for about forty under ordinary barrack conditions.

These buildings and the adjoining "field," which was in reality a shell-holed ruin of a Chinese village that had been destroyed in the 1937 Sino-Japanese fighting, occupied a total space of less than seven acres! But with bare hands as our only tools, we filled the shell holes and cleared up space enough to lay the foundation for a baseball diamond and to provide other recreational space. With the aid of old railroad rails, a drag was fashioned that eventually, after much sweat, provided Pootung Camp with the finest diamond I ever saw. Almost everybody played, even the British. In fact, to the amazement of everyone, the championship for the summer of 1943 went to a British team—our alibi being that the British had more young athletes than we Americans.

Life at Pootung was no picnic. We were given enough food to live on, but it was neither plentiful nor tasty. The daily diet, almost without variation, was cracked wheat

(wormy), ribbon fish or water buffalo meat, rice and a vegetable.

Yet the morale of the American and British prisoners at Pootung was high. The men seldom worried about themselves, the welfare of their families at home being the great source of anxiety.

Although we had only Japanese language newspapers to read, it was surprisingly easy to keep track of the war in the Far East. The newspapers highlighted Japanese victory claims, but the northward progress of United Nations forces could be marked by the frequency with which "His Imperial Majesty's forces made a strategic withdrawal after achieving their objectives."

I believe that a vast majority of Japanese now know that they cannot win the war and that as their situation becomes desperate they will launch a peace offensive based on compromise. The acceptance of such a Japanese offer would be only the prelude to another war.

It was difficult to leave so many of my friends behind but September 19, when I started the long journey back to the United States, was a great day for me. When the ship stopped at Manila I heard the good news that James F. Waples and Harold Evory, Assistant-Superintendents of RCAC in Manila, and Fred J. Sager, Manila cashier, were in good health even though interned. I could discover nothing then about Lt. Earl G. Baumgardner, USNR, who had been Superintendent at Manila, but since arriving in the United States I have learned that Lieutenant Baumgardner is reported as a military prisoner in the Philippines.

Probably the most thrilling moment in my life, and in the lives of the 1,500 other returning Americans, was when the *Gripsholm* hove into sight outside the little harbor of Mormugao, Portuguese West India, where we had been taken by a Japanese ship to await its arrival. The prospect of being free men and women again at last seemed real. No other thrill matched this except our first glimpse of the grand old lady of New York Harbor, the Statue of Liberty, as she appeared through the fog and our tears the morning of our arrival in New York.

# ELECTRONICS EXPANDS HORIZON FOR PLASTICS

*Molded Products Being Turned Out Much Faster, Quality Improved by New Methods*

NEW horizons for the plastics industry and resulting new conveniences for homes and offices, schools and factories, and other institutions were envisaged in a recent address by Fred W. Wentker, manager of the Electronic Apparatus Section of the RCA Victor Division, Radio Corporation of America, at a meeting of the Plastic Club of America in New York.

Molded plastic products already are being produced much faster, without the usual risk of damage to molds, and, most important, with marked improvement in quality, Mr. Wentker said, through new RCA electronic devices which produce and apply radio-frequency current to generate heat in raw material preforms before molding.

Further developments promise to make practicable the use of plastic materials and production of plastic products heretofore prevented by molding limitations. Increased strength resulting from the more complete and more uniform curing made possible by electronic heating, he said, will expand the use of plastics into fields involving stresses for which they have not previously been suited.

Mr. Wentker also indicated the possibility that the higher curing efficiency of electronic heating methods may make practicable the use of less costly plastic compounds for products in which a high degree of strength is not an especially important factor.

Experimental developments and practical experience thus far, he said, have influenced leaders in the plastics industry to state that the introduction of electronic heating is the most significant advance in the industry in more than a quarter of a century.

New plastic materials and new techniques made possible by electronics promise to maintain the momentum gained by the industry during the war, he pointed out, by establishing permanent advantages from the use of plastics in some products in which they have been introduced as wartime substitutes.

Unlike heat applied by steam, hot plates, gas flames, and other conventional sources, which must penetrate industrial materials from the outside, electronic heat is generated within the material by the passage of radio-frequency currents which are produced by electron tubes and their associated circuits.

In the heating of metals for processes such as case-hardening, annealing, soldering, and welding, these currents are induced in the material by passing it through an induction coil. In heat treating of plastics and other non-conducting materials, current is passed through the material by placing it between two electrodes.

Close control of application, which is inherent in electronic methods, makes it possible to confine the generation of heat to any desired area and depth, a particular advantage in such operations as case-hardening, it was explained, or to generate heat uniformly and almost simultaneously throughout a piece of material.

For the plastics industry the latter principle means thorough heating of the inside of a preform without overheating and consequent toughening of the outside, rendering the piece workable at once.

## Research Director



E. W. ENGSTROM, WHO RECENTLY WAS APPOINTED RESEARCH DIRECTOR OF RCA LABORATORIES.

# URGES FREEDOM FOR RADIO

*Trammell Tells Senate Committee Broadcasting Cannot Remain "Half Slave and Half Free" and Continue to Render Great Service to Nation.*

FEAR of the blight of government control hangs over the radio industry, declared Niles Trammell, president of the National Broadcasting Company, in his testimony December 7 before the Senate Interstate Commerce Committee hearing in Washington on the White-Wheeler radio bill.

Mincing no words in his testimony that radio cannot remain "half slave and half free," Mr. Trammell emphasized to the committee that American radio can continue to render a great service to the nation only if it is given "a new freedom from fear." The Congress must determine, pointed out Mr. Trammell, whether "the radio industry is to flourish under our free enterprise system or become a weak and subservient tool of government." He continued:

"The questions that arise in these respects bear upon the fundamental philosophy of radio legislation in determining whether radio will be made to creep or will be allowed to walk in post-war development. For example, present FCC regulations have already imposed a strait-jacket on the creation of television networks by prohibiting the ownership of more than three television stations by any one company."

"Ownership and operation of key stations by networks will be as important in this new service as they are now in standard broadcasting," Mr. Trammell testified. "These key stations will be needed to create the network program service and to provide the economic basis to meet the tremendous development costs. It is clear that such an enterprise cannot be self-sustaining until millions of television receivers have been sold."

He envisaged the marvelous post-war opportunities that promise to revolutionize broadcasting, all requiring large capital outlays. "If private enterprise is to convert these achievements into great public services," he said, "if enough enterprising investors are to be found to create competition in these public services, the radio legislation which you write must be such as to guarantee freedom of opportunity and operation of these services —especially freedom from government domination and control. Only free enterprise can obtain from these achievements the largest dividend in public service."

Pointing out that under a recent decision of the Supreme Court the Federal Communications Commission has been placed in virtual control of radio programs, Mr. Trammell emphasized the urgent necessity of Congress writing a law clearly inhibiting the FCC from controlling program policies or business practices of broadcasting stations.

### *Challenge In Television*

He asserted that the entire concept of broadcasting since the beginning has been one of public service and that the industry acknowledges its social obligations. But that does not mean, he insisted, "that the radio industry wants those social obligations imposed upon it as a matter of licensed authority, especially if it is coupled with a fear of confiscation of investment or a bureaucratic control of its operation.

"Freedom to advance in the radio art demands that those who have developed broadcasting, who have established transmitters, studios and services, be given the opportunity to modernize their facilities to keep pace with scientific and technical progress. The broadcast station or network which is not permitted to transform itself into a sight and sound service will go the way of the silent film or the horse and buggy."

A technical revolution is imminent, awaiting only the conclusion of the war, he averred. Television, of course, offers the greatest challenge to the industry's ingenuity and enterprise, he submitted, and pointed out that today the radio industry is where the motion picture industry was 20 years ago when voice came to the silent screen. The broadcast industry in time must scrap its entire plant and build a new one; hundreds of new stations will be erected, new networks established and thousands of miles of new telephone lines and coaxial cables constructed. All this means, said Mr. Trammell, work for engineers, architects and artisans, work for lumber mills, textile mills and other manufacturers. More musicians will be needed, more performers required, more writers, more salesmen and more employment generally will result.

The task of properly developing wavelengths for the expansion of broadcasting services falls on private enterprise, he said. Private enterprise must carry on the research and development necessary to enlarge broadcast facilities with the encouragement of government or the industry will be placed in a strait-jacket. He declared that the development of broadcasting to its present state had been achieved by private enterprise and that "if private enterprise is to develop the new services now potentially available, it must be given the opportunity free from fear either of confiscation of investment or bureaucratic control of operations. Either would result in discouraging the risk, the initiative and the necessary enterprise."

Asserting that the entire broadcasting industry of the United States had been built on the use of less than 100 roads or wavelengths, he said that we now have available for future use many thousands or possibly millions of new roadways through the ether and thus the art is really in its infancy. "Wavelengths by themselves constitute no physical assets. They must be put to work before they become useful and this requires capital investment and development," he said.

"As we examine the technical developments in the field of radio, it should be apparent that there are vast opportunities for new types of broadcasting as well as many specialized program services," Mr. Trammell said.



# "Just caught the biggest marlin I ever saw!"



*"We strayed out about 125 miles after that marlin so I guess we won't be home tonight . . . But don't worry. I just phoned the weather station and with our old reliable radio direction-finder, we'll make port easy tomorrow . . . I'll give you a ring in the morning . . ."*

* * *

This boat and its skipper are now probably in the service of the Government but when peace comes and once again the harbors and seacoast of our nation are dotted with pleasure craft, we shall see in these boats much that is new.

In radio-electronic equipment, for example, even the smallest craft will be fitted with ship-to-shore telephonic systems and radio-direction finders. They will also be equipped with other radio-electronic instruments which will help make yachting more popular, more pleasurable, and less hazardous than ever before.

At the present time the entire facilities of Radiomarine Corporation of America, including its service stations at twenty-one ports, are totally mobilized for war and are engaged in equipping merchant ships and the ships of our armed forces with complex radio-electronic installations required in fighting a global war . . . When victory is ours, the improved radio-electronic equipment developed for this purpose will be made available for all vessels—from pleasure craft to luxury liners. Radiomarine Corporation of America, 75 Varick Street, New York, N. Y.




RCA RADIOMARINE CORPORATION OF AMERICA

A SERVICE OF RADIO CORPORATION OF AMERICA

RCA

ELECTRONICS IN ACTION






# The Strangest Radio Program

THERE'S a new radio program coming. You won't hear it! You'll *live* it. You and your children. In a new world—the world of *electronics*.

Electronics is radio—but it is also television, the "electric eye," radio-frequency heating, talking pictures. Each of these is electronics because all are basically dependent upon control of electrons by means of *electron tubes*—tubes such as are used in your radio and in the broadcasting stations.

Electronic devices, equipped with electron tubes of proper design, can perform a great variety of tasks. They can control machines and processes. Operate traffic, fire-alarm and other signal systems. Protect factory workers from accidents. Provide quick, mobile police communications. Detect and trap criminals. Sort fruit, nuts, vegetables. Weld, solder, seal, sew, weigh, measure, gauge. Fill bottles. Ease pain, treat disease. Preserve foods. Guide and land airplanes. Spot submarines. Aim and fire guns. Even keep an eye on the baby—literally!

All these jobs can be done electronically—and in almost every case, *automatically*. And electronics, via electron tubes, is going to do immensely *more* after the war. Remember that the fundamental element in *any* electronic device of any *kind* is the electron tube; and that RCA is the fountainhead of modern electron tube development.

RCA engineers in RCA laboratories and in the field are continually developing electron tube improvements of primary importance to the designers of electron equipment. To a greater degree than any other manufacturer, RCA has solved the problem of turning out in quantity high-quality tubes expertly engineered to the requirements of the practical user. RCA welcomes inquiries regarding appropriate tubes and circuits for immediate or contemplated applications. Please write us on your business letterhead. Address *Commercial Engineering Section*, RADIO CORPORATION OF AMERICA, *Harrison, New Jersey*.

TUNE IN "WHAT'S NEW?"

*Radio Corporation of America's great new show, Saturday nights, 7 to 8, Eastern War Time, Blue Network.*



*"RCA ELECTRONICS IN INDUSTRY" is a booklet which may suggest important possibilities for electronic applications in your business. Non-technical, well illustrated. Copy will be sent promptly on request. Please use your business letterhead when writing for it. Address—Dept. 68-5B, RCA, Industrial Division, Radio Corporation of America, Camden, N. J.*




RADIO CORPORATION OF AMERICA



# RADIO AGE

RESEARCH · MANUFACTURING · COMMUNICATIONS · BROADCASTING




RCA

APRIL

1944

RCA

ELECTRONICS IN ACTION




# The Strangest Radio Program

THERE'S a new radio program coming. You won't hear it! You'll *live* it. You and your children. In a new world—the world of *electronics*.

Electronics is radio—but it is also television, the "electric eye," radio-frequency heating, talking pictures. Each of these is electronics because all are basically dependent upon control of electrons by means of *electron tubes*—tubes such as are used in your radio and in the broadcasting stations.

Electronic devices, equipped with electron tubes of proper design, can perform a great variety of tasks. They can control machines and processes. Operate traffic, fire-alarm and other signal systems. Protect factory workers from accidents. Provide quick, mobile police communications. Detect and trap criminals. Sort fruit, nuts, vegetables. Weld, solder, seal, sew, weigh, measure, gauge. Fill bottles. Ease pain, treat disease. Preserve foods. Guide and land airplanes. Spot submarines. Aim and fire guns. Even keep an eye on the baby—literally!

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BUY WAR BONDS

ASK ABOUT... RCA INDUSTRIAL ELECTRONIC SERVICE

RADIO CORPORATION OF AMERICA

# RADIO AGE

RESEARCH · MANUFACTURING · COMMUNICATIONS · BROADCASTING




RCA

APRIL

1944



# America's NEW Frontier

• IN AMERICA'S EARLY DAYS of growth, opportunities for progress lay in the ever widening frontiers. In the fertile lands of the great plains . . . in the timber of our forests . . . in the metal of our mines.

Today, we have reached the limit of our physical frontiers. But new frontiers lie before us—new opportunities for exploration—in our research laboratories. Here in the multiple world of the electron tube are being born the scientific advances that will make our world immeasurably safer and happier.

Pioneering on this new frontier of research are RCA Laboratories in Princeton, New Jersey. Today RCA Laboratories are devoted to providing the fighting forces of the United Nations with the best radio and electronic equipment available. Tomorrow, this same skill will continue to serve America in creating new and finer peacetime products.

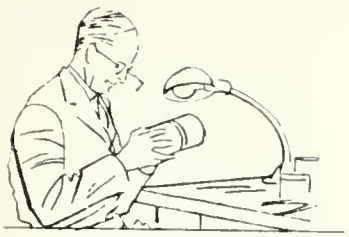


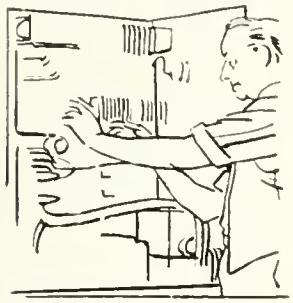
**RADIO CORPORATION OF AMERICA**
RCA LABORATORIES • PRINCETON • NEW JERSEY

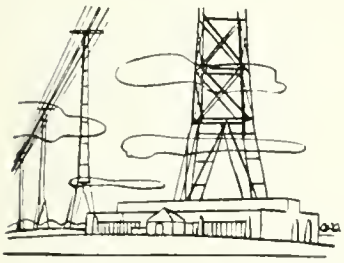
RCA leads the way in radio—television—electronics

RCA

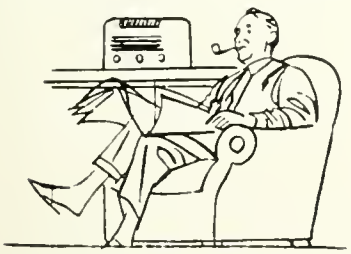
TUNE IN! . . . RCA's great new show, 7:30-8:00 P.M. EWT, over the Blue Network, every Saturday ★ BUY WAR BONDS EVERY PAY DAY ★











THE COVER: NBC's television camera went to the New York Botanical Garden in the Bronx for this colorful scene of Spring fashions and flowers. Wearing a Hattie Carnegie costume is Mary Patton, popular NBC actress.


# RADIO AGE

RESEARCH · MANUFACTURING · COMMUNICATIONS · BROADCASTING

VOLUME 3 NUMBER 3

APRIL 1944


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# ROLL OF HONOR

Thirty-two employees of the Radio Corporation of America, its divisions and subsidiaries have given their lives to defend and preserve civilization and the American way of life. To them we pay reverent tribute.

WILLIAM ADAMSON
CHARLES BAER
WILLIAM BLAIR, JR.
JAMES BOYD
JOHN W. BROWN
THOMAS M. BROWN
RAYMOND W. BUNTING
JOSEPH A. BURCH
EDWARD BURKE
ROBERT CARR
JAMES CROUCH
J. C. EVERT
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ROBERT GREEN
ROBERT GUNSON
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JAMES SCHULTHEIS
WALTER SIMON
RICHARD STEEB
LEWIS HENRY UTLEY
ALBERT WALLWORK
A. T. WILLIAMS
HORACE M. WISE

# Television as Dynamic Sales Force

*ITS COMMERCIAL DEVELOPMENT VIEWED BY T. F. JOYCE AS EFFECTIVE METHOD TO PREVENT POSTWAR BUSINESS SLUMP—CREATION OF 4,600,000 NEW JOBS IN DECADE IS PREDICTED*

HOW will we avoid a depression after the war? Will the soldiers be able to find work? Will our wages be cut when peace comes? What is being done to make sure that people won't be on relief again?

These are questions foremost in the minds of many Americans, according to a Gallup Poll cited by T. F. Joyce, Manager of the Radio, Phonograph and Television Department of the RCA Victor Division, in a recent address that emphasized the part television may play as a dynamic new sales force and vehicle of prosperity in the years after the war. He spoke before members of the Sales Executive Club of New York.

"Obviously, our post-war problem will not be one of production," Mr. Joyce declared, after calling to mind the outstanding achievements of our war factories. "It will be one of distribution. Only as people buy goods are people put to work growing farm products or turning out manufactured products.

"Since our American system is based on individual initiative, the responsibility for furnishing the fuel that will keep this production engine fully loaded necessarily falls upon business management. Specifically, it is the sales management group that must carry the load. They—the sales managers—must develop a total demand for goods and services that will keep all the people who wish to work fully and profitably occupied.

### *Must Lower Costs*

"They must find ways of getting merchandise from our farms and from our factories to the ultimate consumers at lower costs. They must reduce the time needed to show consumers the advantages of the new post-war products and services and to bring about rapid buying of those goods and services on a large scale.

"The sales managers must find more effective ways to show consumers how to use the products of our farms and factories to improve health, lighten the burden of our domestic and farm work, raise the standards of education and culture and bring material happiness and well-being to every home.

"How can they—the sales managers—do this?

"Rather than try to answer that question myself, I have sought answers from a number of leaders in American life. One such leader is Paul Hoffman, President of Studebaker and Chairman of the Board of Trustees of the Committee for Economic Development. He came up via the sales manager's route. He is one of America's greatest sales managers. Here is what he has to say:

> The coming of peace will create a challenge to the sales executives of the United States. They must take on a large share of the responsibility of keeping our factories and our farms in abundant production through their sales activities.
>
> It is estimated that by the end of 1944, the American peo-

RIGHT: T. F. JOYCE OF RCA EXPLAINS TELEVISION'S GREAT BUSINESS PROMISE TO NEW YORK SALES EXECUTIVES CLUB MEMBERS.

BELOW: PART OF CROWD OF BUSINESS LEADERS WHO HEARD NEW SERVICE DESCRIBED AS DYNAMIC SALES FORCE AND JOB-MAKER.









LEFT: SALES COMMERCIALS AS TELEVISION PRESENTS THEM. AMAZING STRENTH OF NEW GLASS AND EASE OF OPERATING NEW VACUUM CLEANER SHOWN.

•

BELOW: SALES EXECUTIVES WATCH SALES DEMONSTRATIONS ON TELEVISION SET.



ple will have accumulated individual savings of 100 billion dollars. That 100 billion dollars is static so long as it remains in the form of nonproductive savings. It becomes a dynamic productive, giving jobs to millions, only as it is transformed into effective consumer buying.

In the post-war period, the sales executives must assume the responsibility of putting this accumulated purchasing power—as well as the post-war earning power of the people—into motion and thus into jobs.

New and better weapons are playing a large part in defeating the enemy. Our post-war sales executives must also make use of new instrumentalities if they are to create the volume of consumer purchases necessary to support our greatly expanded production facilities. The most far-reaching and comprehensive new instrumentality for the presentation of new ideas is now on the threshold—television.

When television is established as a nation-wide service, it will enable sales executives to *demonstrate* their product simultaneously in millions of homes. Television makes it possible to project the most effective sales presentation directly into the intimacy of the family circle. Television is dynamic salesmanship.

In 1940, 46,000,000 people were gainfully employed. If the intelligent advertising and sales use of a nation-wide television system increased the demand for goods and services by only 1 per cent, the effective result will be to create, in terms of 1940 employment standards, 460,000 new jobs. I would not be the one to say that a so far-reaching development as television could not be responsible, within a decade after its full commercialization, for increasing the demand for goods and services by as much as 10 per cent. That would mean potentially 4,600,000 new jobs that have been created as a result of the increased purchasing of goods and services brought about by television.

Paul Hoffman is not alone in this belief, Mr. Joyce declared, adding that in discussing the subject of television, Ed O'Neil, President of the American Farm Bureau, had this to say:

For centuries the farmer has had to live an isolated life. Modern forces have been breaking this tradition down. First came the R.F.D. Then the telephone. Then the automobile. Then radio. All that's necessary to make the farmer as much a member of the commercial community as your next-door neighbor is television.

Television will undoubtedly stimulate the desire of people everywhere for better foods, fancier farm products. Higher average farm income should prevail. If the farmer is thus permitted to share in a general increase in prosperity, he will continue to buy more manufactured goods, and contribute substantially to the increased employment and welfare of all concerned.

To the appraisal of television by these leaders, Mr. Joyce added this statement by Prime Minister Churchill:

I hope to see a vigorous re-

vival of healthy village life . . . what with modern methods of locomotion and the modern amusements of the cinema and the wireless to which soon will be added television, life in the country, and on the land ought to compete in attractiveness with life in the great cities.

These leaders and others in our political, economic, social and religious life, Mr. Joyce announced, see in television "the great scientific accomplishment which will break down the last barriers of man's isolation." And continuing, he asserted:

"Now, to the magic of radio sound has been added the magic of sight. A much greater revolution is ahead of us than when sound was added to the motion picture. The Chinese proverb states, 'One seeing is better than a hundred hearings.' From this, I would deduce that the relative importance of television over radio—FM or standard broadcasting—is in the ratio of 100 to 1."

There is a lively, interesting, once-a-week television program in every department of the department store, Mr. Joyce remarked, because the primary problem of life is living—and to make life worthwhile is the problem of the women, who spend 85 per cent of the income.

### *Television Boosts Sales*

"Or take the travel industry," Mr. Joyce added. "This group, only a moderate user of radio, ranked as the most prominent television advertiser over a two-year NBC experimental period. And for obvious reasons. Bathers splashing in the surf at Miami, in the winter, and beautiful maidens sporting in the snow at Sun Valley, stimulate more train, auto and air traffic than all the still or word pictures in the world.

"So whether you're selling Buicks or bassinets or lower berths, steamship tickets or airplane tours, you're going to sell more of them by television; and what's more, you're going to have to hire *more people* to take care of the extra business."

What proof is there of television's selling power as compared with other advertising media?

"Just this," Mr. Joyce declared. "One of NBC's 1941 television advertisers in a scientifically controlled test determined that the effectiveness of television selling was of the order of ten to eleven times greater than all the other media used by the advertiser combined."

Because television has the power to create consumer buying of goods and services beyond anything that we have heretofore known, he explained, we can count upon its helping to bring about a high level of post-war prosperity in agricultural, industrial and the distributive industries, as well as personal and professional services.

"*This means jobs,*" Mr. Joyce pointed out. "*Jobs are made when people decide to buy goods or services.*"

People valued their money, all through the depression, more than they did merchandise, he said, adding: "It is only when people value merchandise more than money that they are willing to exchange money for merchandise. Television, properly used, has the power to make people want merchandise more than money, thus creating the necessary turnover of goods and services which alone can sustain continuing and useful jobs."

It would not be unreasonable to assume, Mr. Joyce declared, that within ten years after the full commercialization of television, television service would be available to 23,700,000 wired homes or 80 per cent of the wired homes of the United States. This would represent an audience of about 112,000,000 people and approximately 82 per cent of the total U. S. buying power.

"Television industry sales at this point," he said, "should be approximately 2,500,000 units per year for a total retail billing of between six hundred million and seven hundred million dollars. This billing, together with replacement tubes for existing receivers, service, transmitter sales, television advertising revenue, and so forth, will make television the billion dollar industry that many have prophesied it will be."



COLONEL SARNOFF



LIEUT. GENERAL HARBORD

*Col. David Sarnoff, President of the Radio Corporation of America, has returned to active military duty with the U. S. Army overseas. During his absence, Lieut. Gen. James G. Harbord will perform the duties of the President, in addition to his duties as Chairman of the Board.*

Buy War Bonds



NBC TELEVISION PLANNING GROUP, LEFT TO RIGHT, WILLIAM S. HEDGES, VICE PRESIDENT IN CHARGE OF STATIONS; PAUL W. MORENCY, OF WTIC, HARTFORD; NILES TRAMMELL, NBC PRESIDENT, AND O. B. HANSON, VICE PRESIDENT AND CHIEF ENGINEER OF NBC.

# NBC Television Plans

## TRAMMELL, IN STATEMENT TO NETWORK AFFILIATES, ANNOUNCES POLICY TO MAKE NEW SERVICE AVAILABLE TO THE PUBLIC

OF ALL THE post-war developments promised by the progress of the art and science of radio, television presents the greatest challenge and the greatest opportunity, Niles Trammell, President of the National Broadcasting Company, declared in a statement to the 145 NBC-affiliated stations. He then set forth the position of NBC with respect to television, announcing that the policy of NBC "always has been, and will continue to be, to foster and encourage any developments in the broadcasting field which promise better service to the public".

NBC will cooperate with the government and with other members of the industry in line with its research, experimentation and practical operating experience in television, in the effort to secure the best possible standards of operation for a commercial television broadcasting system in the United States, Mr. Trammell declared.

"In developing a basis for an eventual television network," he continued, "NBC will cooperate in every way with the owners and operators of the stations affiliated with its network, many of whom have from the very beginning demonstrated their willingness and capacity to include in their service the latest technical developments the radio art has brought forth."

### *Points Are Enumerated*

Enumerating other important points, he added:

"In preparation for the expected expansion of television services in the post-war period, NBC will, within the limitations of wartime operations:

(a) Expand its existing program service by tapping new sources of program material and talent, and by developing new program techniques;

(b) Transmit field programs once a month or oftener from points outside the studio;

(c) Resume studio broadcasts from the NBC television studio in Radio City, which is now being reconditioned preparatory to the renewal of broadcasting live talent programs;

(d) Continue research and development in all phases of television.

"As soon after the war as materials become available, NBC will construct a television station in Washington, D. C., so that a service of sight-and-sound may be available in the nation's capital, and from the nation's capital to other cities when interconnection between stations is made available."

To establish the anchor points of a television system, Mr. Trammell explained, NBC has filed additional applications with the Federal Communications Commission for construction permits for television stations in Chicago, Cleveland, Denver, San Francisco, and Los Angeles, where NBC already maintains a programming organization and studio facilities. It is hoped that the FCC will act favorably on these applications, Mr. Trammell said, adding:

"A nationwide network will not spring up overnight, but must proceed as an orderly, logical development. Such a development, as we see it, would establish television networks in the following possible ways:

1. An Eastern Network that will extend from Boston to Washington, with stations located at such intervening points as Worcester, Providence, Hartford, Schenectady, New York, Philadelphia, Wilmington, and Baltimore, with perhaps an extension to Syracuse, Rochester and Buffalo.
2. A Mid-West Network that will develop with Chicago as its hub, spreading out to Milwaukee, Minneapolis, St. Paul, Des Moines, St. Louis, Indianapolis, Detroit and Cleveland.
3. A Pacific Coast Network utilizing the great talent center of Hollywood, connecting with San Francisco and gradually extending to other important points.

"These regional networks will gradually stretch out over wider

areas, and will themselves become linked together. Thus, city after city across the continent will be brought into network operation, until finally complete nationwide networks will become a reality."

Viewing television as a forward stride in the field of communications as great as aviation has proved to be in the realm of transportation, Mr. Trammell described the networking of television programs on a nationwide basis, when this can be achieved, as "one of the major services of the 20th Century to the American people".

Despite the problems and the risks which confront the broadcasting industry, Mr. Trammell said, the National Broadcasting Company believes that television service should be brought as soon as possible into every American home, and that this is, and should remain, the task of private enterprise. In conclusion, he declared:

"NBC will continue its activities in the field of television with vigor and confidence, with absolute faith in the vital significance of sight-and-sound broadcasting to the American public. Television promises to be the greatest medium of mass communication yet evolved with unparalleled opportunities for services of entertainment and education. It is our belief that NBC affiliates will join in these activities and share in that faith. By such cooperation, we will successfully meet the challenge and the opportunities which television presents to the initiative and courage of American enterprise."

### *Schedule Outlined*

Together with his statement, Mr. Trammell made public a letter from Keith S. McHugh, Vice-President of the American Telephone and Telegraph Company, which outlined a schedule contingent on the war and other considerations, for the installation of special coaxial cable for long-distance transmission of television signals.

The schedule shows how three regional transmitting projects eventually may be joined in a 6,000-to-7,000-mile, all-American television network, as follows:

1945—New York-Washington

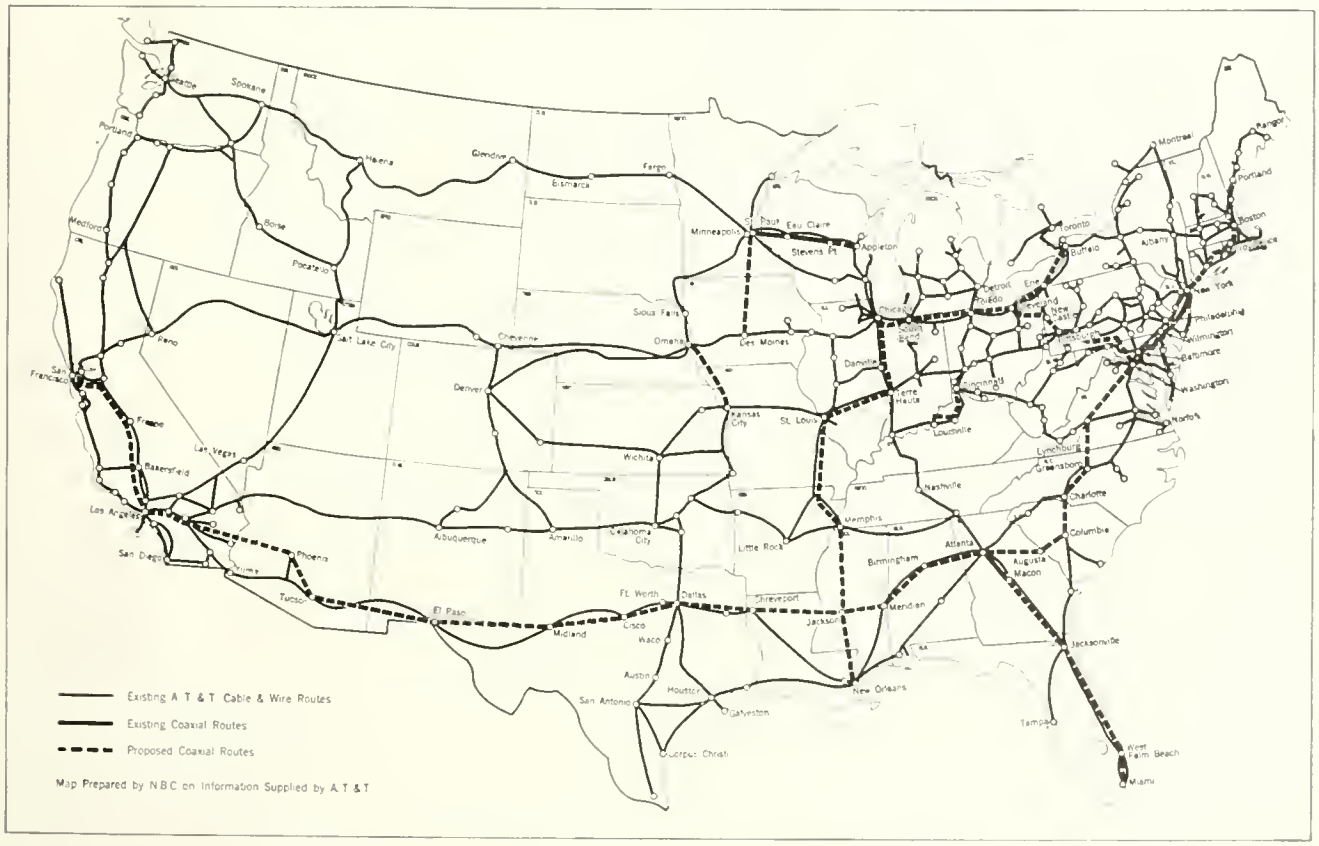
1946—New York-Boston; Washington-Charlotte; Chicago-Terre Haute-St. Louis; Los Angeles-Phoenix.

1947—Chicago-Toledo-Cleveland-Buffalo; part of the Southern transcontinental route including Charlotte; Columbia - Atlanta - Birmingham - Jackson - Dallas - El Paso-Tucson-Phoenix.

1948-'50—Completion of Southern transcontinental route; Washington - Pittsburgh - Cleveland; St. Louis-Memphis-New Orleans-Kansas City-Omaha; Des Moines-Minneapolis; Atlanta-Jacksonville - Miami; Los Angeles-San Francisco.

Buy War Bonds

PROPOSED INTER-CITY CONNECTIONS OF COAXIAL CABLE FOR TELEVISION.



# RCA Research Aims

## SCIENTIFIC DEVELOPMENTS IN RCA LABORATORIES CONTRIBUTE TO SOCIAL AND INDUSTRIAL ADVANCEMENT OF THE NATION



By Otto S. Schairer

*Vice President in Charge*
*RCA Laboratories*

RADIO CORPORATION OF AMERICA was created to put into practical use the contributions of science and engineering. Its subsequent growth and progress have been based in large measure upon the achievements of its laboratories.

The first quarter-century of RCA history has been marked by initiative and resourcefulness in research and development, and by revolutionary ventures to make the results of its original work of service and benefit to the public.

Global, marine, continental, aeronautical and broadcasting communication by radio have become commonplace. Radio and electronics contribute greatly to the superiority of weapons, equipment and communications which are assisting the armed forces of the United Nations in winning the war. Television, frequency modulation and facsimile broadcasting, radio relaying and many other new radio and electronic services and devices will speed reconstruction and rehabilitation in the postwar period.

RCA has pioneered and has exercised initiative and leadership in all of these fields. Its research, development and inventions have been major factors in the creation of these new services and products. Its record of scientific accomplishments and of contributions to industrial progress is inspiring; it is one of which all members of the organization can be proud. It strengthens their determination to meet the challenges of the present to make a greater future. Advancement of the radio, electronic and kindred arts is their primary objective. Original, creative and constructive work are the means employed to attain this end.

The efforts of the scientists and engineers of the Laboratories are devoted to the discovery of previously unknown principles and phenomena; to the revelation and expansion of knowledge; to the extension of horizons. They explore new fields and remove barriers to progress. They create and develop new and improved industrial processes and products; and provide new communication and other services to the public.

### *First Laboratory In 1919*

In these ways RCA Laboratories are endeavoring to promote continued industrial expansion, ever-increasing employment opportunities for workers and investors, improvement of living and working conditions, betterment of the general welfare, and greater understanding and community of interest among peoples.

Important as were the inventions existing when RCA was organized, they were inadequate to make possible the development and rendering of an efficient and reliable global communication service by radio. Out of this necessity for further research and development was born the first improvised and crude laboratory of RCA in 1919. It was located in a tent at Riverhead, L. I., with a staff of five engineers.

As the business of RCA developed and was extended into other radio fields including manufacturing, additional laboratories were established in or near its various plants and offices. A large step in the development of the present research organization occurred in 1930 with the integration of the research, engineering, manufacturing and selling operations in radio fields which had previously been conducted by the General Electric and Westinghouse Companies and RCA. This brought together many experienced research workers who formed the nucleus of the staffs until recently associated with the manufacturing activities of RCA.

It was long the dream of those in charge of the research work of RCA that some day central laboratories would be erected to which would be transferred many, if not most, of the research activities which originated at several scattered locations. After the outbreak of World War II in Europe increasing demands were made for the conduct of research and development work directed toward the creation of new radio implements of war. It soon became apparent that the research laboratories should be moved out of the principal manufacturing plants to provide space

THE FIRST RCA LABORATORY—A TENT AT RIVERHEAD, L. I., IN 1919.



for production, and also that improved and more extensive laboratory facilities would be necessary to enable the research men more effectively to devote their efforts, and to use their talents, to assist in the achievement of victory.

### *Awarded Army-Navy "E"*

Exactly one year before Pearl Harbor the first scouting trip resulted in the finding of a site for the new Laboratories near Princeton, New Jersey—a community conducive to creative and original thought and work. Three weeks before Pearl Harbor the site had been acquired, plans, drawings and specifications had been prepared, the first floors and basement were completed and the cornerstone laid. Ten months later the buildings were dedicated and the Laboratories were soon in full operation. Into them were brought the research staffs and facilities formerly located at the manufacturing plants at Camden and Harrison, New Jersey.

Before the Princeton Laboratories had been in operation a year they were awarded the coveted Army-Navy "E" flag to which one star has been added.

The buildings already erected at Princeton represent about two-thirds of those originally planned. Erection of the remainder of the buildings was prevented by the war, but it is the intention to erect them when conditions permit. They will accommodate other laboratory staffs and facilities now located at other places, as well as offices for the Patent and other departments.

Every effort has been exerted to make the new Laboratories outstanding and highly creditable. To this end a location was sought which would facilitate developing an atmosphere conducive to creative and original thought and work in a community where men gifted with the talents essential to such work could live and rear their families under cultural and stimulating influences. The Princeton area meets these qualifications. Furthermore, it is accessible from the principal plants and offices of RCA by means of the main line of the Pennsylvania Railroad and many good highways.

A large tract of land was acquired to provide insulation from external disturbances and to permit of indefinite future expansion of the enterprise. The large tract makes possible landscaping and a setting for the buildings which will convey an impression of stability and quality intended to give expression to the nature of RCA and all of its undertakings. In the further development of the project it will be given much of the character of an institution set in beautiful grounds resembling a park or campus.

### *Influence On Work*

Being designed for experimental work, the Laboratories themselves are an experiment in elevating the tone of industrial enterprise. It is hoped that they will be regarded as a pattern for the establishment of decentralized units where workers can live in comfort and health and work under ideal conditions. These factors are emphasized because it is believed that they have a beneficial influence upon the important work of the Laboratories.

Since the work now being done relates to military and naval activities, nothing can be said at this time concerning its specific nature. Suffice it to say that the wartime inventions added to those of the pre-war period hold promise for great expansion of the radio art and industry in peacetime.

### *Aids to Other Industries*

Undoubtedly, television and radio relays, and their many by-products and outgrowths made possible in large measure by the work of RCA Laboratories will prove to be the most important and most extensive of the new services and products. Television and other developments in the field of the higher frequencies will provide not only a vast new medium of communication, but they will also provide aids to transportation and travel by land, sea and air which will contribute greatly to safety, reliability and speed.

Radio and electronics will revolutionize, improve and expedite innumerable manufacturing processes and provide many new and superior materials and products. In short, there is probably no branch of science or industry which offers more promise for future development and progress than radio and electronics.

Having been created to assume a position of leadership in radio, and to that end having been granted the right to use and to make available to others the radio inventions of

THE PRESENT HOME OF RCA LABORATORIES AT PRINCETON, N. J.; OCCUPIED IN 1942.



several domestic and foreign organizations, RCA was given a unique opportunity and responsibility further to develop the radio art and to promote progress of the radio industry. In effect, it was given the radio "ball" to carry forward.

Early in its history RCA adopted a practice of making its inventions available to responsible applicants by means of patent licenses. Such licenses include all unexpired patents of RCA and all with respect to which it has or may have the right to license others during the periods of the licenses which it grants. They, therefore, include both the present and future inventions made both in RCA Laboratories and in those of several other organizations.

### *May Extend Licenses*

More than 200 such licenses have been granted. Some of them extend to 1947 and others to 1948. All of them may be extended by the licensees at their options to 1955, which is the latest date of expiration of the agreements by which RCA acquired rights to grant licenses under the patents of certain other organizations. These licenses impose no restrictions upon the volume or proportions of the business that licensees may do, nor upon the prices at which they sell their products. Under these conditions it is not possible for RCA to monopolize any part of the radio or electronic business, nor for RCA nor any of its licensees to suppress any licensed invention.

For many years the Industry Service Division of the Laboratories has rendered technical services to the many licensees of RCA. It furnishes them with technical information concerning advances in the radio art, informs them periodically of the inventions which become available to them under their licenses, and assists in putting them into practical use. Facilities are also provided for testing and measuring apparatus developed by licensees. These laboratories like all others have recently devoted their efforts exclusively to war work. However, when the requirements of war diminish, they will again undertake to serve licensees, and it is the intention greatly to improve and develop this service.



INGENIOUSLY PLACED BEHIND THE WALL PANELS OF THE EXECUTIVE CONFERENCE ROOM AT RCA LABORATORIES IS THIS ARRANGEMENT FOR DISPLAYING MAPS, CHARTS, DRAWINGS, AND MOTION PICTURES.

During and shortly following its organization agreements were made between RCA and a number of foreign concerns under which RCA acquired the right to use their inventions in the United States and to permit others to use them, and under which RCA granted rights to the foreign companies. Most of these agreements have terminated or will expire by the end of 1944. In the postwar period it is the intention of RCA to grant non-exclusive licenses under its foreign patents, as in the United States, and to use them to expand the markets for its products.

In concluding this article, it seems appropriate to say that the continued aggressive conduct of research, inventive and development work in RCA and other laboratories is dependent to a large degree upon the maintenance of a healthy patent system. Without the protection afforded by such a system only such constructive work could justifiably be undertaken as could be paid for out of immediate sales and use of new ideas. No one would be willing at his own expense to undertake major, long-range and expensive developments if the complete practical results of his vision and courage, and of his efforts, expenditures and sacrifices, could be appropriated by others without their contributing to the development and without their making the slightest compensation to the entrepreneur.

It is inconceivable that the radio art could possibly have made such accelerated progress, or could have attained such an advanced state as it has, if it had not been for the encouragement and protection afforded by patents. There is no better example of how the patent system stimulates and accelerates scientific research and industrial progress than is afforded by the development of electronic television which has already required more than two decades of persistent efforts.

### *System Provides Incentive*

To make television its present reality required imagination to visualize its potentialities for service and benefit to the public; initiative, courage and determination to create and develop it into a practical medium of communication; perseverance in original and constructive efforts; and the expenditure of many millions of dollars. It was the stimulus and incentive afforded by the patent system, and the reasonable assurance of reimbursement and reward which it provides, that induced the television pioneers to devote their talents and resources to such a hazardous undertaking.

Surely it must have been enterprise of this character, which is so definitely in the public interest, that the framers of the Constitution intended to encourage and reward when in that document they empowered the Congress to pass laws which would "promote the progress of science and the useful arts by securing for limited times to authors and inventors the exclusive rights to their respective writings and discoveries."

As Lincoln once said "the patent system . . . added the fuel of interest to the fire of genius in the discovery and production of new and useful things." He classed the introduction of patent laws with the arts of writing and printing, and with the discovery of America, as occurrences of peculiar value in facilitating inventions and discoveries.

But there are those in high places whose words and actions are causing so much confusion and misunderstanding that there is danger of the patent system becoming impaired and weakened and made ineffective as a medium for rendering great public service. They are tinkering with an intricate but highly useful mechanism that has contributed greatly to the scientific and industrial supremacy of the United States, that has provided continually increasing employment for workers of all classes, and that has been of great social and economic significance.

### *Strange Theories Advanced*

Many strange theories and doctrines are being advanced by those who are apparently unsympathetic with patents. Among them none are more at variance with the intent of the patent laws than some of the tests of invention that have recently been proposed. One of them is the "flash of genius" test,—which is purely subjective and would provide only one process by which an invention could be made.

More than a century ago when the patent system was young and its foundations were being laid, and when men still understood the Constitution, the United States Supreme Court, through the eminent Mr. Justice Story, said:

> It is of no consequence whether the thing be simple or complicated; whether it be by accident, or by long, laborious thought, or by an instantaneous flash of the mind, that it is first done. The law looks to the fact, and not to the process by which it is accomplished. It gives the first inventor or discoverer of the thing, the exclusive right, and asks nothing as to the mode or extent of the application of his genius to conceive or execute it.

By the great preponderance of Court opinion since that time the objective test of invention has been applied—namely, that it must be an advance in the art and involve the exercise of more than the expected skill of the calling; something that would not be obvious to one skilled in the art. The true test is whether or not the contribution substantially advanced the art, and not the mental or other processes by which the progress of the art was made possible.

### *Invention Is Defined*

Then there are those who say that there is no invention "in the exercise of persistent and intelligent search for improvement", and that "neither the result of great industry in experimental research nor the successful product of a gradual process of experimentation over a period is invention."

According to this theory, step-by-step progress, and especially when made by two or more persons or a group working together in diligent and sustained effort to advance a science or an art, would not be rewarded by patents on such steps as constitute invention judged by the long-established standards. If this theory were generally accepted, which fortunately it is not, it would discourage and destroy organized and systematic scientific research and put most research laboratories out of existence. No more mischievous and wanton theory could be suggested.

An idea is no less an invention because it is only a step forward, rather than a leap, or because it is based upon prior steps forward either by the same individual or another. If each step forward involves the exercise of more than would be obvious to persons skilled in the art who are confronted with the problem, it is invention.

### *Progressed Step-by-Step*

The sciences and arts have always progressed by the step-by-step process. It is only the combination of many steps forward, and usually those of many people, that great progress is made. No single human mind has ever been great enough to conceive of, and to produce, such advances as radio communication, radar or television in fully perfected and useful form. These required long and tortuous effort and involved many ingenius steps by many contributors.

Patents were obviously intended to promote progress whether by lone inventors, by joint inventors, by groups, by organized and systematic efforts, by large and small laboratories, by flashes of genius, moments of incandescence, or by continuous, persistent and persevering research and development. The patent laws do not discriminate between the many ways of promoting progress which provide mankind with new services and goods, improved standards of living, greater employment and general betterment of the public welfare.

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## Buy War Bonds

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LEFT: DR. H. H. BEVERAGE, ASSOCIATE RESEARCH DIRECTOR OF RCA LABORATORIES; BELOW: DR. V. K. ZWORYKIN, ASSOCIATE RESEARCH DIRECTOR; E. W. ENGSTROM, RESEARCH DIRECTOR, AND B. J. THOMPSON, ASSOCIATE RESEARCH DIRECTOR.



# MacLEISH SERIES ON NBC

*Life and Literature of the Americas Recalled in "The American Story", New Inter-American University of the Air Presentation.*

TRACING the history, development, and fulfillment of the literature of the Americas is a job that has been entrusted on the new National Broadcasting Company series, "American Story," (7:00 p.m., EWT Saturdays) to Archibald MacLeish, Pulitzer Prize winning poet and Librarian of Congress. As the third permanent presentation of the NBC Inter-American University of the Air, the series represents the first time, not only in radio but also in the history of literature, that a contemporary literary figure has been commissioned to produce a cycle of inter-related literary works.

MacLeish, who quietly asserts that Americans do not understand their common background, has as his immense canvas the life and literature of the Western Hemisphere for the last four and a half centuries. And into the study of these aspects of American development, the poet has poured an immense amount of painstaking research, including authenticating obscure facts, reverting to original source material for his quotations, re-checking sound effects,—in fine, re-creating to the utmost the atmosphere and conditions that actually existed in the days of which he writes.

The distinguished poet sets the framework for each broadcast in his sound effects. His exploitation of sound as a means of setting the scene is unusual.

Even the sound directions are written in the same poetic style that marks the dialogue. Witness this direction in the initial broadcast, telling of the journey of Columbus to the new world: "The roll of a ship in a slow swell . . . the slapping of canvas . . . the catcry of a gull." Or later, this effect, designed to simulate the caravels on their way at sea: "Sound of the sea, of the wind in a ship's rigging, of the great sails flattening and filling, of men in the handling of a ship, the words inaudible, this sound washes over the Admiral's words or falls beneath them. It is a continuing sound of the caravels in the great sea. It is always heard under or over what follows."

All the sound devices at radio's command are employed by MacLeish to set the stage for the narration.

### *Uses Poetic Narration*

In addition to the laborious research and authentication, the poet includes the most important fillip—his own brilliant style of the prose poem, a style which has won for him the accolades of the literary world. Each line read on the broadcast is a part of this poetic narrative style, giving each program a dramatic sweep so necessary in producing the effect desired.

MacLeish says, candidly, that he is employing his artistic talents to create new forms of radio expression. His is no conventional radio drama. The broadcasts present a phase of American development, as represented in the logs and the journals of the men who discovered the lands, in the original chronicles of life in the New World, and in the tales that returned to the Old World from the new, tales that prompted the vast flow of peoples to these lands. They tell a story, to be sure, but the conventional form of radio drama is not utilized in the presentation. MacLeish's technique varies with each broadcast, for as he says, this is an experiment. The dramatic form, narration, straight reading from sections of great literature, a combination of the three, and even several new variants such as reliance on sound itself to tell part of the story—all these techniques have been tried and tested until they meet with the poet's satisfaction.

To date, the broadcasts have sketched the discovery of the new lands as culled from the logs and journals of the discoverers, the journeys of the discoverers on the coasts of the New Land, the Indian reactions to the advent of the white man on their soil, the wars against the Indians on both continents, a humorous discussion of Amerigo Vespucci's "discovery" that led to the naming of the new lands, and accounts from the Americas as reported by people living here. Before the series is finished, MacLeish expects also to demonstrate how much alike was the birth of freedom on both the western hemisphere continents, and just how this freedom was extended by the peoples of the land.

"I think one reason the Americans find it so difficult to get along



AT LEFT, ARCHIBALD MACLEISH, NOTED AMERICAN POET, WHO DIRECTS NBC'S "THE AMERICAN STORY" SERIES. BELOW, HE WATCHES FRANK POPP, PRODUCER, DEMONSTRATE THE SOUND OF A SAIL BLOWING, AND (AT RIGHT) HE NOTES SHIP'S RIGGING SOUND EFFECTS.





one with the other, is that we don't understand our common background." MacLeish has said. "From Alaska to the tip of South America, every stage of life was the same. The Pilgrims landed in Massachusetts, with the sea behind them and the wilderness in front. But the same thing happened in Olinda, in Brazil. Each community felt out the shoreline, and infiltrated slowly into the wilderness. Each had wars with the Indians, and each established frontier after frontier. All the settlements went through the colonial stage in which the government was foreign and the people already American. Each felt the urge toward free development and each became free through revolution.

"This is the common American Story," he concludes.

### *Comments Are Favorable*

Favorable comments from newspaper editors, educators, producers, and a number of men of letters have already been forthcoming. The *New York Times,* after the initial broadcast, said: "A prodigious task, clearly. . . . There was something immediately attractive about the beginning of it; something which, for want of a better word, you may call simplicity. . . . The result—as Mr. MacLeish, with a poet's sensitivity, surely calculated—was "the sense of the wonder long ago."

One of America's most distinguished poets, MacLeish is also author of a number of challenging poetic dramas for radio. MacLeish was awarded the Pulitzer Prize in 1932 for his "Conquistador." He was appointed Librarian of Congress by President Roosevelt in 1939, a position he has filled with distinction.

As Sterling Fisher, director of the NBC University of the Air has explained, all of the University's permanent series, of which "American Story" is the third, are designed to attract and instruct the casual listener who may tune in to only one of the broadcasts. And the regular listener who listens week after week will gather the benefits of the comprehensive college course.



MISS MARY FRETCH, ORIGINATOR OF TIME-SAVING IDEAS, RECEIVES WPB CERTIFICATE FROM DONALD M. NELSON AT LUNCH IN HER HONOR.

# MARY FRETCH IS HONORED

***Worker At Harrison Plant of RCA Victor Division Awarded Title of "Best Woman Suggester" To Speed War Production At Washington Ceremony***

THE Nation has honored another RCA Victor war worker for outstanding production suggestions which help speed equipment to the armed forces of the United States and its allies.

Miss Mary Fretch, employed at the Harrison plant for 14 years, was singled out by the War Production Board for special honors in ceremonies held in Washington, D. C., March 3, and heard herself described as the nation's best woman suggester.

RCA Victor's "Arsenal of Ideas" was the only woman among eight war workers summoned to Washington from all parts of the country to receive special certificates from the WPB. She likewise was the only representative of the radio industry.

During the last year, Miss Fretch, a quality control inspector, has won awards of approximately $800 for three suggestions which are credited with saving 35,000 man-hours annually in the output of tubes at the Harrison plant.

One of her valuable time-saving ideas was portrayed in the nation's capital at the National Labor-Management Production Exposition in the Department of Commerce auditorium. The RCA exhibit, prominently placed at the auditorium entrance, was highlighted by a huge portrait of Miss Fretch. She was at the exhibit explaining her production suggestions to visitors.

Miss Fretch received her WPB certificate from Donald M. Nelson at a luncheon attended by Paul V. McNutt, chairman of the War Manpower Commission, and Frances Perkins, Secretary of Labor.

Her Washington trip included visits to the Pentagon, Arlington Cemetery, Jefferson Memorial, Washington Monument, Lincoln Memorial, National Art Gallery, the House office building and Congressional press galleries.

# Antennas Point Ahead

## LONG AND INTENSIVE RESEARCH BRINGS NEW AERIAL DEVICES TO ASSIST IN GROWTH OF SOUND BROADCASTING AND TELEVISION



By Dr. George H. Brown
*RCA Laboratories*
*Princeton, N. J.*

THE painstaking development of radio antennas has contributed immeasurably to the growth of the radio industry—ofttimes preceding engineering advances in sound broadcasting, television, facsimile and "FM" broadcasting.

Investigations and study of the properties of antennas date back to a period almost 30 years before Marconi's success in radio-telegraphy. Maxwell, Hertz, and Poynting are among the great scientists whose discoveries and theories have been the basis for the modern antenna systems that have sprouted since the advent of radio communication. About 1900, it was Max Abraham who probed the action of a half-wave antenna in free space and, as far as I know, was the first to evaluate the radiation resistance of a half-wave antenna.

As radio developed, the long waves were first used for broadcast purposes and the shorter waves were used for point-to-point communication. Just as this division in wave length came about because of the difference in application, so was there a division in the development of antenna structures.

In the first broadcasting stations, the antenna usually consisted of a giant T, supported by two wooden or steel towers. Since the action of this type of antenna was not well known, the horizontal portion of the T was regarded as highly important. It accordingly was built of cages of wires or a number of parallel wires held in position by spreaders. The vertical portion was looked upon as a carrier of energy to the horizontal portion. But, as a matter of fact, the vertical part of the average T antenna radiates 98 per cent of the total radiated power.

It soon was found in a number of cases that the antenna induced strong currents in the steel supporting towers. The re-radiation from these currents was enough to greatly distort the radiation pattern of the system. Measured horizontal patterns were found to be oval and sometimes the shape of a figure 8. Reduction of the distortion was achieved by developing insulators to isolate the tower from the earth. The next obvious step was to use a single insulated tower for the antenna proper.

### *Used Model Antennas*

The theoretical work of Stuart Ballantine, published in 1924, brought another important advance. It showed that where the antenna consisted of a straight wire, the maximum field strength along the horizontal was achieved when the wire was six-tenths of a wave length. In 1931, with the construction of the first self-supporting tower antennas, the height set forth by Ballantine was taken as optimum. But operating experience with this type of structure soon showed a grave difference between theory and practice.

Because of the difficulty in performing critical experiments on towers several hundred feet in height, work was carried out in our laboratories on the use of model tower antennas. Experiment brought out the fact that, since the towers were not a uniform cross-section throughout their length, the current distribution differed from the sinusoidal distribution assumed by Ballantine. The model antenna technique not only explained the action of existing antennas, but also pointed the way to improvement of these antennas and assisted in justifying the construction of "constant cross-section" antennas.



"TURNSTILE" ANTENNA USED WITH THE FM TRANSMITTER OF STATION WCAU, IN PHILADELPHIA.

When the first "constant cross-section" antennas were constructed and tested, it was found that the results predicted by Ballantine were realized. However, by 1934, there were a number of cleared-channel stations in operation. Almost invariably, the night service distance was not limited by signal intensity. The limit of service was determined by the so-called selective fading zone, that region where the direct ground wave and the sky wave reflected from the Kennelly-Heaviside layer were about equal in magnitude. Here, these two waves first reinforced and then tended to cancel, with consequent fluctuation and distortion. Studies of these effects, together with consideration of the properties of antennas by RCA engineers, led to the almost universal adoption of the "constant cross-section" antenna for cleared-channel stations, with the total antenna height equal to 53 per cent of a

wave length, the so-called 190 degree antenna.

Theoretical investigations indicated that the efficiency of broadcast antennas could be increased materially by the use of more extensive ground systems. Experiments showed that by using larger ground systems there was an appreciable saving in antenna heights without heavy loss in efficiency.

The extent of our investigations may be seen in the fact that before their completion sixteen separate and complete ground systems were laid. For tests on each system, the antenna height was varied from 10 to 100 feet, in 10-foot steps. For each one of these 160 combinations, complete measurements were made of antenna resistance and reactance, field intensity one mile away, current distribution in the buried wires, and total earth current distribution.

The trend to use constant cross-section antennas for high-power cleared-channel broadcasting stations grew, and it became evident that the guyed-type of antenna would be more economical than others. But from the field came objections that the guy wires would distort the radiation pattern. To obtain data on this point, our investigations included theoretical studies, experiments with models and actual full-scale tests to confirm the model experiments.

In a number of cases, it was not possible to erect a 190 degree antenna because of the proximity to airports or airways. Top-hat antennas were then resorted to. Here a large set of outriggers was placed on the top of the tower to act as a capacity, thus altering the current distribution so that the radiation pattern of a 190 degree antenna could be obtained with an antenna which was actually shorter than the optimum.

In general, it is not physically possible to construct a hat of sufficient diameter to reach the best point. To get around this obstacle, the hat was mounted on insulators and connected to the top of the tower by means of an inductance coil. The addition of this coil not only allowed the use of a smaller hat, but gave great flexibility in exactly achieving the desired results, for the proper adjustment was achieved simply by moving a tap on the coil. In practice, the addition of a top hat in one instance more than doubled the effective night service area.

### *Further Studies Made*

Further studies by RCA engineers showed that more efficient operation, with lower voltages, could be obtained by using a sectionalized antenna. In this antenna, the insulators were used to break the tower at a point approximately one-third of the distance from the top. The coil was again used to connect the two parts of the tower. In certain special cases, a combination of sectionalizing and top-hat seemed desirable. Model measurements have been especially helpful in studying top-loading problems.

As the number of broadcasting stations increased, directional antennas began to appear. Arrays used in the broadcast band had two purposes: First, so that the energy may be concentrated in a given area, thus increasing field strength to equal that attained by pumping more power into a single non-directive antenna; secondly, and perhaps more important, to protect the service area of another station in the same or adjacent channel. In the latter case, the action is to "chop a hole" in the radiation pattern so that the signal traveling toward the other station is cut to very small values. Such action makes possible the operation of several regional stations on the same channel.

According to my information, the first commercial broadcasting station to use directive antenna for that purpose was WFLA, at Clearwater, Florida. The array there consisted of two quarter-wave antennas separated a quarter of a wave length, and fed so that the currents in the antennas were equal and in time quadrature. The antennas were so set up that the signal in the direction of the primary service area of WTMJ, at Milwaukee, Wisconsin, was reduced to very small values. Successful results at WFLA inspired many stations to install similar equipment.

Our antenna development group concentrated on the development of directive antennas. These experiments made it possible for us to design the first "asymmetric" directional antenna system, now in use at Station WTAR, at Norfolk, Virginia.

The model technique was further used to study problems arising when individual towers in an array are of unequal height, and information obtained through our tests proved valuable in the installation of this system at Station KDYL, Salt Lake City.

More, the use of small model antennas, operated at ultra-high frequencies, helped us develop methods and apparatus which could be put to work immediately when it became desirable to produce antennas for that type of broadcasting. Close

INFORMATION OBTAINED BY RCA ENGINEERS IN THE STUDY OF MODEL ANTENNAS MADE POSSIBLE THE DIRECTIONAL TYPE OF ANTENNA NOW IN USE AT STATION KDYL AT SALT LAKE CITY.



contact with RCA service engineers, as well as engineers in the field, led us to design the "groundplane" antenna used in police radio.

In high-frequency broadcasting, it is usually desirable to radiate signals to all points of the compass. This prevents robbing one section in order to concentrate the signal in other areas. A simple antenna radiates a good bit of energy at angles above the horizontal plane. Therefore, a logical step toward increasing signal strength in the horizontal plane seemed to be to take the wasted energy from the higher angles and redirect it to the horizon. The RCA Laboratories development group produced an antenna for this specific purpose.

This antenna resembles a turnstile and, indeed, that is the name by which it now is known. The first models of it used open wire feeders and exposed insulators. It was necessary to adjust or "match" the transmission lines leading from the transmitter to the antenna after installation.

The RCA antenna group continued work on "Turnstile" antenna development over a period of several years, so that a few years ago, when FM broadcasting became popular, a design was ready which could be installed completely, ready to operate without field adjustments.

Advantages of the turnstile antenna are apparent as we consider the problem of transmitting television. For in telecasting, the antenna must match the transmission line from the transmitter over a wide band of frequencies. In one version of the turnstile, the means of obtaining the circular radiation pattern automatically provides the broad-band feature. And when provided with a rather simple network, it may be operated as an ordinary antenna for both sound and picture transmitter without the use of complicated filters.

Increasing use of very high frequencies in radio brings the problems of antennas to the foreground and adds to their number. The tough job for engineers who are doing research on antenna systems and associated circuits is that of deciding which one of the problems to attack first.



# EMERGENCY WALKIE-TALKIES

*Police, Firemen and Doctors May be Equipped with This New Radio Communications Marvel After the War—Other Possibilities Outlined*

MILITARY needs have brought such advanced developments in radio communication that firemen and policemen in the postwar period may be equipped with walkie-talkies to fight fire and crime with radio.

And through the same medium doctors may keep in touch with offices and hospitals, and operators of trains, busses, taxis and trucks would receive their instructions from headquarters while on the move.

### *No Sudden Transition*

H. F. Mickel, manager of the Police and Emergency Communications Section of RCA Victor, Camden, outlined the foregoing possibilities at a recent conference of the International Municipal Signal Association in Philadelphia, attended by signal system experts and officials of cities throughout the country.

Although he declared the possibilities almost limitless in communications and industrial electronics, Mr. Mickel emphasized there would be no sudden transition from the present status. Rather, he said, existing equipments and methods would be improved and expanded instead of being rendered obsolete overnight.

As an early possibility in the public safety field, the RCA engineer suggested that firemen carrying walkie-talkie sets small enough not to hamper their movements could be directed inside a blazing building by a superior officer on the outside who would be supplied the necessary information by the men throughout the structure. The same technique, he said, could be employed in combatting forest fires.

Another probable development, Mr. Mickel forecast, would be the equipping of all foot and traffic policemen with tiny two-way radio sets through which they could keep in constant touch with headquarters. These applications, he said, will be made possible through the development of new circuits, tiny tubes and components.

"It is probable that future emergency communications systems will tend toward the use of higher frequencies in the radio spectrum," Mr. Mickel said. "Again let me point out that this is the result of gradual evolution rather than the application of a radically new prin-

ciple. The first police and fire department radio systems operated on medium frequencies just above the standard broadcast band. A few years later a gradual swing to the use of channels in the 30- to 40-megacycle band began. However, this transition did not render the original systems obsolete and unusable.

### *Trend to Higher Frequencies*

"The first automatic radio relaying systems in the emergency communications service were in the 30 to 40 MC portion of the spectrum, but just prior to the war, a group of channels in the 116 to 119 MC band was allocated for such use. It can be seen, therefore, that the gradual tendency is toward higher frequencies and it is believed that the trend will continue.

"The use of higher frequencies will result in lower-powered transmitting equipment, smaller-sized apparatus and highly efficient antenna systems. Higher frequency systems may be more readily controlled to cover the exact areas desired, thus making more efficient use of available power. Higher frequencies will also result in the availability of a large number of additional channels.

"Perhaps this will open the way for many new radio applications and services. We may see two-way radio in common use by doctors, bus companies, trucking concerns, taxicab companies, railroads and many other similar users. Many of these services have been investigated in the past, but sufficient channels have not been available to permit the use of radio in such cases. The rapid advancements being made in the radio and electronic field may present a speedy solution to this problem."

Higher frequencies also will lead to the more common application of automatic relaying units, Mr. Mickel said. Where great distances are to be covered and direct transmission is beyond the range of available equipment, automatic relaying or repeater units may be interposed to pick up the transmitted signal and pass it along to the receiving point.

"An example of automatic relaying is found in the radio system in operation on the Pennsylvania Turnpike," he continued. "Here, unattended relay stations pick up and pass along transmissions from one end of the turnpike to the other. A message originating at any point on the turnpike is clearly heard by all the cars patrolling the road, by all the toll office personnel, by Pennsylvania State Police headquarters in Harrisburg and Bedford and in all maintenance buildings along the right-of-way.

"This system has been in operation for more than two years and effectively proves the practicability of such apparatus. The use of higher frequencies will make such systems more common and easier of accomplishment."

As a development of the present-day fire alarm system, Mr. Mickel visualized a standard radio receiver which, when switched off at night, would maintain in operation a tiny receiver which would connect the loudspeaker and permit transmission of any desired message when actuated by a specific signal from headquarters. Such a device would have wide application in police and fire systems for calling out reserves or off-duty members, he said.

"We will also see electronic heat indicators for actuating fire alarms," the engineer said, "and the burglar alarm of tomorrow may readily use invisible light rays to prevent any visible indication that such a detection device is in operation."

## Chicago Orchestra on NBC

A major addition to the imposing list of NBC music offerings was the launching of "Orchestras of the Nation" on Saturday, March 25 (NBC, 3:00 to 4:00 p.m., EWT). First of the nation's great musical ensembles to be featured on the series is the Chicago Symphony Orchestra under the baton of Desire Defauw.

The Chicago Symphony is billed for the first five Saturdays of the series. Future orchestras are to be announced.

Samuel Chotzinoff, manager of the NBC Music Division, participated in the opening broadcast and was welcomed to the Windy City at a luncheon given by Edward L. Ryerson, president of the Orchestra Association.



# RCA Cadettes on Job

*NEW EXPERIMENT GIVES OPPORTUNITY TO COLLEGE GROUP AS ENGINEERING AIDES ENTER SIX PLANTS OF VICTOR DIVISION*



By Dr. C. B. Jolliffe
*Chief Engineer*
*RCA Victor Division*

WHAT may turn out to be a milestone in social and educational as well as industrial change was established a few weeks ago at Lafayette, Indiana. The event was a commencement—which is a word used by educators for graduation exercises held to signify that certain students have finished their academic studies—an end that is a beginning. Commencement really means, therefore, that the students are now ready to commence work. None of these particular graduates had any doubts about work. They all had jobs which have been waiting until they finished their training.

### *Students Carefully Selected*

The graduates, seventy-three in number, were all young women, most of them under 25 and a few not yet 20 years of age. They had all been hand-picked from RCA's own plants and from among the nation's thousands of young college women. What is unusual in this case is that the entire graduating class were already employed, and by a single employer. Still further to upset precedent, the students had been at Purdue University for only ten months. These were RCA's first "Engineering Cadettes".

These young women are all at work today as Engineering Aides in the six plants of the RCA Victor Division. They are the products of the first adventure in the intensive training of young women for specialized technical work in the field of radio and electronics. While they are by no means novices, they realize that they still have a lot to learn.

They have completed intensive courses in mathematics, drawing, shop and manufacturing processes, electric circuits, electrical measurements, radio theory and electronics. In their training they learned to weld, assemble, activate, age, evacuate and test a triode tube, as well as to build a six-tube super-heterodyne radio set, and learn the theory behind the operation of each.

That women can learn to operate milling machines, drill presses, lathes and other power tools, as well as hand tools in assembly and repair work, is no longer news. Many of those who scoffed at the idea prior to Pearl Harbor have lived to admit that on many of these operations women are not only as good as men, but in some cases they have shown even better aptitudes. But if any one had said three years ago to the average educator that women could be taught what these Cadettes have learned in ten months, he would have been regarded as an impractical visionary. One professor, who has since become quite enthusiastic, actually shook his head when the plan was launched and said he could not teach radio theory to students who had not mastered integral calculus. He was willing to try, he found it could be done, and he now is an ardent supporter of the idea.

It goes without saying that the war emergency and shortage of manpower impelled the RCA Victor Division to establish this special class of Cadettes. Several corporations in other industries notably aviation, have also undertaken similar plans. Mr. F. H. Kirkpatrick, Manager, Personnel Administration, was responsible for the farsightedness in this planning a year ago to meet the need for technically trained employees.

A few years ago women engineers were as scarce as women lawyers were a quarter of a century ago; as scarce as women physicians. Today, women have made for themselves a permanent and welcome place in both of these professions. There is no reason why this should not be equally true in electronic engineering.

### *Show Serious Interest*

Although it is still too early to say definitely how far these pioneering girls will go in their profession, there is every reason to believe they are fitting satisfactorily into the company's operations. It is perhaps significant that of the seventy-three who were graduated three were married during the training course, but they stayed to continue their career. This is some indication of the serious interest these young women show in their work.

Faculty members at Purdue University are very enthusiastic about the accomplishment of the Cadettes. Their work was satisfactory. In a few cases the level of achievement equalled that of the best regular electrical engineering students, and the class average was above the usual University average. The high number of seventy-three graduates from an initial class of eighty-six is also evidence of their interest. Of the thirteen who did not complete the course, six voluntarily dropped

ENGINEERING AIDE HELEN MUENSCHER, ONE OF THE RCA "CADETTES", IS SEEN AT WORK IN ELECTRON MICROSCOPE LABORATORY AT RCA VICTOR, CAMDEN, N. J.



out to return to technical employment at the company's plants. The seven who withdrew altogether did so for personal and health reasons.

Though nothing like this class had ever been attempted before, and in many ways it was contrary to pedagogic tradition, Purdue faculty members gave their full support and cooperation to the idea that intensive training for a specific objective was feasible.

### *Postwar Effect Studied*

Educators and industrialists looking to the future for the supply of college trained men and women are giving a great deal of thought today to the effect RCA's pioneering educational project may have on college courses after the war. Although the Cadettes followed an exacting schedule of forty hours a week of class and study hours for the ten months they were at Purdue, they were also regular members of the student body and enjoyed the privileges of college life. They lived in regular dormitories and participated in many college activities.

Under the terms of the contract made between RCA and the University, the Cadettes were responsible to the University Administration. A great deal of credit must be given to Miss Frances M. Tallmadge, who was RCA's representative on the campus, but her responsibility concerned itself with counseling and company relations. Discipline, had there been any need for it, was a faculty matter. As a consequence, the most harmonious relations between RCA and Purdue were maintained and the girls were loyal and enthusiastic employees of RCA as well as ardent Purdue supporters.

The question now being asked is whether many other young men and women — and their parents — may not set up a demand in the future for similar short training courses in other fields of technical study. Also what effect this is likely to have on the social and economic patterns of the nation. There is no doubt that many traditional educators might feel, in that event, that we would be turning out too many students whom they would regard as having only a partial engineering education, although for many kinds of work it would be very adequate. There are some who feel that true education is a process which ends only with death, and starts with actual experience. They hold that technical work in college is only preliminary training to the real essence of education — which lies ahead on the job.

RCA is happy to welcome these young women to its shops and laboratories. They are tackling their jobs confidently, with poise and assurance. What is even more important, with ambition and enthusiasm. It will not be surprising if many of them advance rapidly within the next few years. There is plenty of room at the top, and few barriers to brains and ambitions.

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Buy War Bonds

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## POSTWAR FACSIMILE EXPANSION POSSIBLE

*RCA Research Director Says New Broadcasting Service Is Ready for Wide Use.*

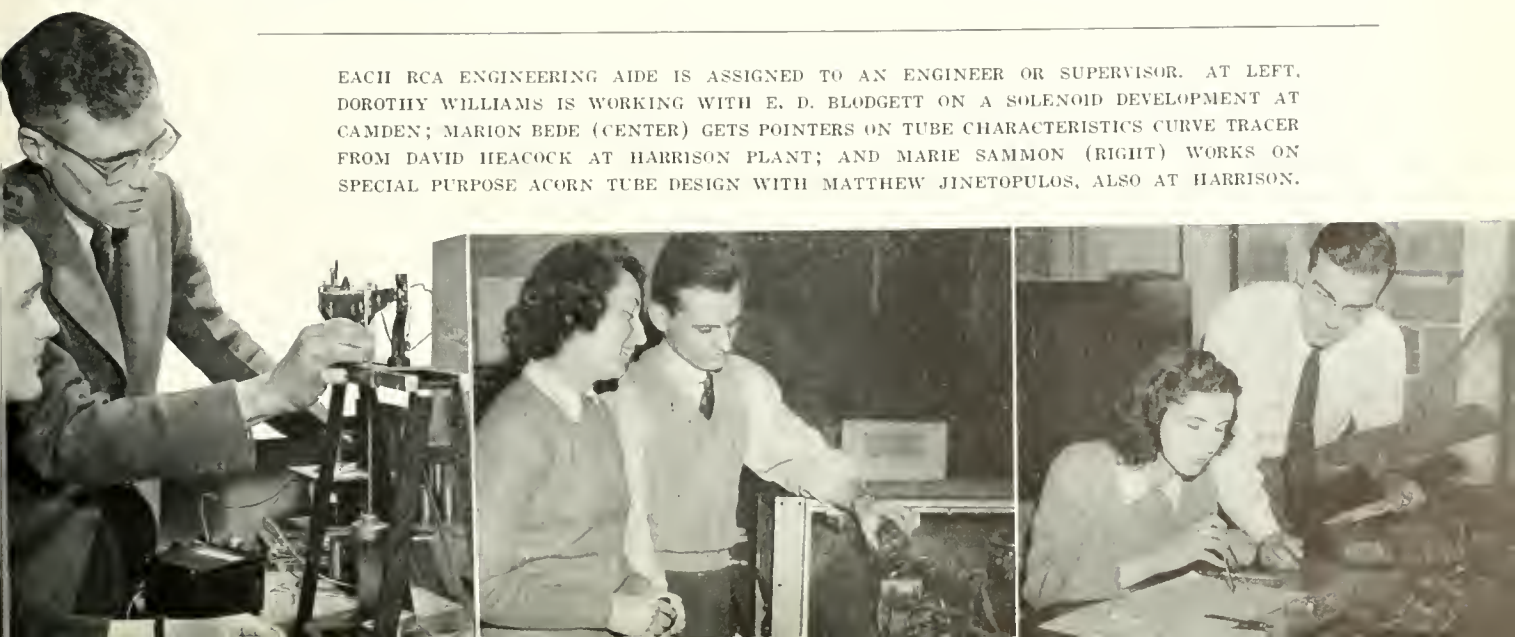
Foreseeing effective and reliable home and office type radio facsimile recorders capable of printing news at the rate of several hundred words a minute and pictures equal in quality to the best found in newspapers, E. W. Engstrom, Research Director of RCA Laboratories, Princeton, N. J., on February 17 ranked this new kind of radio service at the side of television and frequency modulation (FM) broadcasting as a definite possibility for expansion early in the post-war period.

Addressing several hundred members of the American Marketing Association at a "Radio-in-Wartime" luncheon at the Hotel Sheraton, New York, Mr. Engstrom said: "Facsimile is a service that can now be made available. There is still needed a comprehensive market survey to indicate the form it should take and the kind of services it should render.

Mr. Engstrom expressed it as his belief that television, FM, and radio facsimile are the three most significant trends in broadcasting.

"Television is a new service ready for public use," he explained. "Frequency modulation broadcasting is in addition to the already established and accepted sound broadcasting service. Facsimile is a new service which awaits knowledge of how it should be introduced and used."

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EACH RCA ENGINEERING AIDE IS ASSIGNED TO AN ENGINEER OR SUPERVISOR. AT LEFT, DOROTHY WILLIAMS IS WORKING WITH E. D. BLODGETT ON A SOLENOID DEVELOPMENT AT CAMDEN; MARION BEDE (CENTER) GETS POINTERS ON TUBE CHARACTERISTICS CURVE TRACER FROM DAVID HEACOCK AT HARRISON PLANT; AND MARIE SAMMON (RIGHT) WORKS ON SPECIAL PURPOSE ACORN TUBE DESIGN WITH MATTHEW JINETOPULOS, ALSO AT HARRISON.

# Plant Broadcasting

## SYSTEM HIGHLY DEVELOPED BY RCA VICTOR SPEEDS FACTORY-WIDE COMMUNICATION, AND IMPROVES EMPLOYEE RELATIONS



By David J. Finn

*Sales Manager,*
*Industrial and Sound Department,*
*RCA Victor Division*

AN axiom of industry is that the problems of management multiply as the size of an organization increases. This factor makes its initial appearance while a business is still very small. At that point where an employer has to hire a foreman or any other assistant to help him supervise his workers, he begins to lose direct personal contact. No matter how able his aides, that slows up his line of communication.

Plant broadcasting is one of the most effective means of overcoming this handicap. Basically there is nothing new in it. For paging, for communications and for music it has been in use for many years. However, when the war emergency placed especial emphasis on harmonious relationships between workers and management as a requisite for more effective production, plant broadcasting came into its own.

Although many questions still remain to be answered concerning the most effective use of sound systems, there is no longer anything hit or miss about it. A considerable fund of information has already been gathered, mainly in acoustics and by psychological research into the actual benefits of music for men and women at their jobs, particularly when these jobs are of the repetitive type. Added to this, is much valuable experience in war plants under almost every conceivable condition.

According to those who are using it, plant broadcasting is doing a really important job in war plants. This was again confirmed in a recent survey conducted by the War Production Board in Washington, which disclosed that 87% of plants using a sound system stated that music improved morale and 57% reported music increased production. In nearly everything that has been written on the subject, however, emphasis has been laid on morale. The word has been used so much that it sometimes loses its meaning. Drawing from experience and scientific studies, we are now beginning to realize some of the true potentialities of plant broadcasting—and these potentialities have assumed an importance far beyond the expectations of those who pioneered in this field.

### *Four Basic Units*

What is plant broadcasting? When I say there is nothing basically new in it I am referring chiefly to the equipment. There are still only four basic units: The microphone, the control desk, one or more amplifiers to supply broadcasting power, and the functional loud speakers. Initially, sound equipment for plants was very crude compared to the equipment available today. There are now, for example, several types of microphones designed to meet the different needs. The master control desk or cabinet of today is stream-lined and built with an eye to future as well as present needs. There are a number of types of speakers, each of which serves best under conditions suited to its specific characteristics.

It is estimated that thousands of industrial plants in the United States are now equipped with sound systems of one kind or another, and a large percentage is broadcasting music. There would be many more plants in both categories if the necessary priorities could be obtained for the material, and if the manpower was available for the installations. Surveys indicate there are about 14,000 top industrial plant prospects for sound equipment. The market is certain to expand as more industrialists learn the multiple advantages of modern sound systems.



SPEAKING AT PREVIEW OF MOTION PICTURE "MANPOWER, MUSIC AND MORALE," EDUCATIONAL DIRECTOR MARK STARR, OF I.L.G.W., REVEALS SURVEY RESULTS.

Just now, when war production output is a paramount requirement, the greatest attention is being given to the influence of music on production. Dr. W. A. Kerr of the Personnel Planning and Research Department of the RCA Victor Division has recently completed one of the most thoroughgoing studies in this field. Among his conclusions, based on experiments continued over five months with groups of varying numbers and different occupations, are that in 12 comparisons, average output was greater when music was broadcast than when it was not. Average quality of production was higher with music in 7 out of 10 comparisons.

"Present evidence," says Dr. Kerr, "indicates best production with music that is interpreted as of moderate or peppy tempo. It does appear that the time has arrived when industrial music may be increased further in effectiveness by systematic evaluation of the effects of specific music factors on quantity, quality, and net good yield."

If morale is to be defined as interest in one's work, here is unquestionable evidence of what music can do for the worker. It is evidence also that plant broadcasting is of

definite use in bringing about closer relationships between employer and worker, in large plants particularly. It also takes the worker's mind off his own real or imaginary troubles and makes him feel that he is part of the organization. Even though this may not always reveal itself in an immediate output increase on a specific operation, the net long-range effect on any organization is self-evident.

### *Many Studies Made*

The studies by Dr. Kerr were made in various plants of the RCA Victor Division. Many somewhat similar studies have been made for shorter periods by users of RCA equipment, and others. S. Wyatt and J. N. Langdon report that the British Industrial Health Research Board found an increase in output ranging from 6.2 to 11.3 per cent while music was being played, while the total daily output showed an increase of 2.6 and 6.0 per cent. The long-run effect was noted by Wynford Reynolds of the British Broadcasting Company.

"First of all," said Mr. Reynolds, "do not expect the wrong things from music; do not expect it to act as an immediate means of speeding up. It is a tonic like a cup of tea, something to cheer the mind. You will get increased output all right, but it will be spread over the work-spell as a whole. You will not necessarily get it while the music is actually being played."

The RCA Victor Division is in a particularly favorable position to evaluate factors such as the foregoing, as well as the varying effects of different kinds of music for different types of work, because of its own long experience in the field.

RCA plant broadcasting and industrial music activities are centralized in the Sound and Picture Section of the Industrial and Sound Department. This department is in constant touch with new ideas and methods developed by users of RCA sound equipment. In this connection, it might be noted that RCA is the only company that manufactures every item of equipment going into the most complete sound system.

Installations are made by RCA engineers, and though all the individual units have been standardized, every system is custom-made to meet specific requirements. As the first step in this process, a scientific sound survey is made in the plant where the system is to be installed. Noise level readings are taken. The physical layout of the buildings is studied. Notations are made of acoustic obstacles to be overcome. From these studies it is possible to determine exactly what equipment is required, where it should be placed and the right volume at which it should be operated.

After the actual installation has been made the next step for the user is to acquire a sound system operator, who assumes responsibility for its operations. RCA Victor provides a manual of operating instructions, and special training schools are made available to purchasers at various times throughout the year. A few of the points covered in the instruction courses are: planning the program, use of the microphones, setting up area controls, recording, rehearsing live talent, and the filing and care of records.

### *Employees Cooperate*

With the system in operation, the RCA Victor Division supplies a third service designed to uncover any special conditions that may exist in the plant. For this purpose special "attitudes toward music" blanks are distributed to employees. These contain a list of sixty-one selections, divided into thirteen distinct types of music. The employees are asked to check what they like best in the preliminary programs being broadcast to them from the selections in the Victor Music library. These blanks are tabulated, studied and charted.

The Music Library Service at present offers a choice of three record libraries. These are the Mealtime Library, containing 100 selected standard recordings; the Econ-







WORKERS DOING MONOTONOUS TASKS, EXTREME LEFT, ARE AIDED BY MUSIC, AND KEPT INFORMED OF PLANT HAPPENINGS BY PAGE GIRL AT "MIKE," CENTER. TYPISTS AND OTHER OFFICE EMPLOYEES, BELOW, ALSO FIND RELIEF IN WELL-CHOSEN PROGRAMS.

omy Library of 300, and the Budget Library of 600. It is the purpose of the company to offer larger libraries when materials and manpower are available. Each of those now offered is supplemented at the time of shipment with 20 currently popular releases. In addition, subscribers to the services are given preference on shipments of new monthly record releases, now averaging four records a month.

### *Control Room Complete*

When an RCA plant broadcasting system goes into operation the control room is complete not only with the mechanical equipment, but also with the clerical forms required for ease of locating and handling records while the system is being operated. With each 100 records, the company provides 400 color-coded index file cards, a carton of 300 RCA Victor needles, 200 envelopes for filing discs, a numerical loose-leaf record reference catalog, a "Music America Loves Best" record catalog, and the RCA *Industrial Music News*.

RCA internal broadcasting systems are now being used in virtually all types of manufacturing plants, including shipyards and other projects with men working at widely separated points. They are providing service in churches, schools, theaters, the chapels of funeral parlors, in stores, hospitals, freight yards and in ball parks and other public gathering places. So far, no installation has been found too large to be handled over a single system, with accurate area control.

While the foregoing has been concerned chiefly with music in war plants, music service by no means sums up the value of a plant broadcasting system. In one large plant, the paging function was carefully checked for a month and was found to have saved 4,000 man hours. Key men are never really away from their posts with an adequate sound system, for they can be reached instantly at whatever part of the plant their duties may call them. The effect of this in stepping up the tempo of any organization from the top down will be obvious. At the risk of being repetitious, I might note here that the loss of contact between employer and employee which takes place as a business grows is not the fault of the workman. It is due to the fact that supervisors simply do not have the time to meet and talk personally with all the men and women under their direction.

### *Reaches All Employees*

A plant broadcasting system makes it possible for management to maintain direct contact with employes. In effect, it provides management with an automatic and instantaneous mass-meeting of all employees at their work, and it does this without interfering with production. It enables management to provide a service of current news bulletins which often have a direct bearing on the urgency of the war work in which the plant is engaged. In many plants the sound systems are used to convey birthday greetings, announcements of births and similar events of interest to employees.

That sound systems are here to stay in the manufacturing plants of the country is now a certainty. In the opinion of many industrial relations men, it will be the unusual factory that does not have both controlled sound and music within a few years after the war ends. Altogether apart from the surveys, employees in all types of plants have shown that once they get a taste of music at their work they demand it more often. This is often brought out forceably when anything happens to the system, or if it is cut off for experimental purposes. Music is looked on by thousands of workers as an essential factor.

### *Studies Are Continuing*

While the sound equipment now available is vastly superior to that obtainable when the first plant sound installations were made, this does not mean that technical development has stopped in the improvement of this equipment. For example, a continuing study of speaker types is being made by John Volkman for RCA at its Indianapolis plant; of acoustics by Dr. Harry Olson of the RCA Laboratories; of general plant coordination by K. J. Hollister at the RCA Service Company, and of better sound equipment production methods by M. C. Batsel of the RCA Indianapolis plant. The psychological studies by Dr. Kerr and his associates are also being extended. Survey findings, together with new ideas for the use of sound and music, are made available to all users of RCA plant sound equipment.

## Buy War Bonds



## Bougainville Interview

*Lieut. Robert W. Sarnoff, USNR, son of Col. David Sarnoff, President of Radio Corporation of America, chats with a group of Bougainville children who escaped from inside the Japanese lines. Lieutenant Sarnoff is on duty with the Navy in the South Pacific.*

# RCA OUTLINES FM POLICIES

*Postwar Plans for Manufacturing, Selling Full Line of Equipment, Broadcasting by New Method Are Announced by Jolliffe, Trammell.*

EMPHASIZING the interest that the Radio Corporation of America and the National Broadcasting Company have had for years in the technical development of frequency modulation, or "FM" as it is popularly known, Dr. C. B. Jolliffe, Chief Engineer of the RCA Victor Division, and Niles Trammell, President of NBC, have announced policies that will govern post-war manufacturing and selling of FM equipment, and broadcasting by means of this new method.

"Prior to the war, RCA had developed and was ready to put into application some novel FM circuits," Dr. Jolliffe told a New York meeting of FM Broadcasters, Inc. "We expect to incorporate these circuits in apparatus produced in the post-war period. We manufactured and supplied FM broadcast transmitters prior to the war. Equipment was installed then and is now operating in such cities as New York, Philadelphia, Detroit, and San Francisco.

"As soon as civilian production is resumed, we plan to offer for sale a complete line of FM transmitters. These transmitters will have the power ratings required by the industry and will follow the general trend of our previous models except for the inclusion of new circuit features and mechanical simplifications. These transmitters will meet all the technical requirements of the FCC for frequency stability, freedom from distortion, and other characteristics that insure good and reliable service. In the post-war period, all RCA standard broadcast audio equipment will meet the present standards of fidelity for FM and consequently all standard equipment will be satisfactory for use with FM transmitters."

Dr. Jolliffe said in summarizing: "Our policy is simple and clear. We intend to design, manufacture, and sell types of apparatus for which a need exists and which the public wants. We intend to use our background of experience in the broadcast, transmitter, and receiver field plus our engineering facilities to provide the type of equipment the broadcasters need to satisfy the requirements of their listeners and the licensing authority."

Mr. Trammell, outlining network policy in a statement to all NBC-affiliated stations, said:

"The objective sought by NBC is to make its programs available to every radio listener in America, regardless of whether a standard band or FM receiver is being used. The availability of these NBC Network programs throughout the United States on both standard and FM transmitters will assure present and future owners of FM receiving sets that they can continue to hear their favorite programs on an improved radio service."

### *Research Results Shown*

It was pointed out by Dr. Jolliffe that for many years RCA research has been carried forward in RCA Laboratories on specific FM circuits, on the amazing characteristics of very high frequencies, and on the needs of FM broadcasting. RCA engineers have made important contributions, among them the Seely discriminator and the Crosby FM transmitter, now in use not only by RCA but by other organizations.

Regarding the portion of the FM system in which the public particularly is interested—the home receiver—Dr. Jolliffe said:

"As one of the larger producers of home radio sets, we expect to offer for sale to the public FM receivers of high quality design at reasonable prices. We expect that these sets will do full justice to the FM programs of FM stations."

The policy of NBC, according to Mr. Trammell's statement on FM, has always been and will continue to be to foster and encourage new developments in the broadcasting field. NBC's FM station W2XYZ was the first FM station to be established in New York by any network broadcaster. An application already has been filed for a frequency modulation station in Chicago, and NBC has applied for five additional construction permits for FM stations in cities where this network maintains studios. When these stations are erected, NBC will have a total of seven FM stations.

Advantages of FM, the NBC points out, include:

Virtual elimination of disturbances in reception from natural and man-made static.

Higher fidelity of sound, since wider channels are made available.

Constant service areas, instead of variation from day to night, as in standard broadcasting.

Many stations can operate on the same frequency by judicious geographical spacing without creating interference in the normal service areas of FM stations operating on the same channel, such as occurs on the regional and local standard band channels which shrink the nighttime service areas of those stations.

It is the belief of NBC, however, that FM stations cannot depend solely on these technical advantages in attracting large audiences, Mr. Trammell explained. First and foremost, they must offer programs which are attractive to listeners. The Company holds to the opinion that if FM is required to create or maintain a separate program service, designed solely for FM listeners, who for the first few years will not be numerous, its development

will be greatly retarded due to limited economic support. Such a separate program service would face the competition of well-established and popular programs of the present standard broadcasting system.

Therefore, to stimulate the progress of FM, NBC proposes to make its network programs available to the FM stations operated by the NBC standard band affiliate stations. To insure equal treatment to all NBC network advertisers, it is obviously necessary to carry the same commercial programs on the companion FM stations as are carried by the standard band group.

As soon as an adequate number of affiliates establish companion FM stations, NBC proposes to utilize either improved telephone circuits covering a broader range of frequencies than are currently used, or an automatic radio relay system capable of transmitting programs from point to point with high fidelity.

In respect to cooperation with advertisers, which is recognized as necessary to insure a sound economic foundation for FM, NBC plans no additional charge to advertisers who use the affiliated FM stations during the development period. The rate of the standard band stations and the FM stations is to be established on the premise that it is a single service, until such time as the combined total audience justifies rate adjustments.

### *To Receive Applications*

It is to be the policy of NBC to extend to its affiliates the first opportunity to program their FM stations with NBC service. In such communities as may not now receive primary service from NBC stations and in the absence of standard band stations, applications for affiliation will be received from operators of FM stations.

NBC believes that as the size of the national FM audience increases, there should be enough FM stations across the country to permit the organization of several new national networks comprised of FM broadcasters. For all practical purposes, FM using its present allocation in the radio spectrum, will provide as many broadcasting frequencies as there will be broadcasters to use them. The number of stations, however, may be limited by economic considerations.

In the opinion of the NBC, FM will afford a new opportunity to improve radio broadcasting, with the ultimate test hinging on the extent that improvement affects the program furnished the listener. The Company has stated that it welcomes this opportunity to cooperate with its affiliated stations.

Out of the extensive research and development work, which RCA has conducted tirelessly from the inception of FM, have come inventions by RCA engineers that have long been available to the radio industry, by means of patent licenses. Such licenses include not only the existing inventions of RCA and patents of others under which it has the right to grant licenses, but also future inventions made or acquired by it during the life of the licenses. The licenses run to 1947 and 1948, and may be extended to 1955, at the option of the licensees. They impose no restrictions upon the volume or proportions of the business which the licensees may do, nor upon the prices at which they sell their products.

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## RCA PRESENTS MUSIC AMERICA LOVES BEST

*New Network Program Features Outstanding Stars of Both Classical and Popular Fields.*

EACH Saturday night at 7:30 P.M. (EWT) over the Blue Network, the RCA Program—The Music America Loves Best presents a versatile half-hour show that combines the outstanding stars in both the classifical and popular worlds of music. Jay Blackton, a musician who is well known for his talents in both fields, is conductor of the RCA Victor orchestra and chorus.

Since its premiere date March 4, the parade of stars on The Music America Loves Best has included: screen and opera soprano, Jeanette MacDonald; popular baritone, Perry Como; Alfred Drake, singing star of the Broadway smash-hit musical "Oklahoma!"; the Metropolitan Opera's sensational 18-year-old coloratura soprano, Patrice Munsel; renowned Russian basso, Alexander Kipnis; lyric soprano, Mary Martha Briney; famed blind pianist and musical satirist, Alec Templeton; Artur Rubinstein, hailed as one of the greatest virtuoso's of the piano today; and popular mezzo soprano, Nan Merriman.

Jay Blackton, the maestro in charge of this musical show, is a musician, who, by his own description, has led a "dual career." That is, a career that has included distinguished experience in both classical and popular music. His original goal was to be a concert pianist. In this pursuit, he studied at Brooklyn Academy of Music and presented his first recital at the age of 12. This he followed with further study at the Institute of Musical Art and a scholarship to the Julliard Graduate School of Music. He also studied abroad.

Along came "difficult times," and Blackton reports that "I was forced to abandon my long hair and arty ideas in favor of dance orchestras." That, says Blackton, "was the beginning of my dual career." He spent several years as an arranger and conductor of popular dance bands and at the same time made appearances as a concert pianist. Today, his well-versed background in the popular field has won him the assignment as musical conductor of Broadway's most successful musical, "Oklahoma."

# RCA Income Increased in 1943

IN AN all-out effort in every phase of radio to help win the war, Radio Corporation of America increased its production of vital radio, sound and electronic equipment for the U. S. Army and the United Nations in 1943 more than 100 per cent over 1942, it was announced in the Company's 24th Annual Report released by David Sarnoff, President of RCA on February 26, and mailed to 230,000 stockholders.

The report emphasizes that no other force than radio could link the widely separated areas of our military and naval operations, and at the same time cites the vital job which radio is doing on the home front, declaring that the American system of broadcasting, with its traditional freedom, is "serving the war effort night and day."

All divisions of RCA—research laboratories, manufacturing plants, broadcasting and communication facilities—are contributing to the conduct of the war, according to a joint message to stockholders from Lieut. General J. G. Harbord, Chairman, and Mr. Sarnoff. Calling attention to the fact that this year marks the twenty-fifth anniversary of RCA, they described the Company's achievements as "a quarter century of progress in the history of radio." They said that post-war planning is being conducted without interfering with the tasks of war.

The report shows consolidated gross income of RCA for the year 1943 was $294,535,362, compared with $197,024,056 in 1942, an increase of $97,511,306. Net profit, after all deductions, was $10,192,452 in 1943, compared with $9,002,437 in the previous year. After payment of preferred dividends, earnings per share of common stock amounted to 50.5 cents, an increase of 8.8 cents over 1942.

Indicating the further upward trend of Federal Income Taxes, provision for these taxes was $26,124,000, or 37 per cent over 1942, and representing 72 per cent of income before tax deduction. In addition to these Federal taxes, the total state, local, social security and other taxes amounted to $4,723,049, compared with $3,787,763 in 1942.

## RCA'S TEN-YEAR RECORD OF EARNINGS

*(The figures shown for all years prior to 1941 include Foreign Subsidiaries)*

| Year | Gross Income | Net Profit Before Federal Income Taxes | Federal Income Taxes | Net Profit After Federal Income Taxes | Earnings Per Share on Common Stock (Based on present capitalization) |
|---|---|---|---|---|---|
| 1934 | $78,756,994 | $5,055,114 | $ 805,850 | $4,249,264 | $.074 |
| 1935 | 89,228,898 | 6,026,673 | 899,800 | 5,126,873 | .137 |
| 1936 | 101,186,310 | 7,293,037 | 1,137,100 | 6,155,937 | .212 |
| 1937 | 112,639,498 | 11,142,158 | 2,117,300 | 9,024,858 | .418 |
| 1938 | 99,968,110 | 9,095,772 | 1,683,700 | 7,412,072 | .302 |
| 1939 | 110,494,398 | 10,149,511 | 2,066,700 | 8,082,811 | .350 |
| 1940 | 128,491,611 | 13,364,656 | 4,251,500 | 9,113,156 | .425 |
| 1941 | 158,695,722 | 26,566,316 | 16,373,600 | 10,192,716 | .502 |
| 1942 | 197,024,056 | 28,077,287 | 19,074,850 | 9,002,437 | .417 |
| 1943 | 294,535,362 | 36,316,452 | 26,124,000 | 10,192,452 | .505 |

### *Sources of Income*

The sources of RCA's 1943 gross income were:

| | |
|---|---|
| Manufacturing Division | $211,386,587 |
| Broadcasting | 60,847,401 |
| Communications Companies | 18,764,549 |
| Miscellaneous | 3,536,825 |
| Total | $294,535,362 |

Disposition of the year's income was as follows:

| | |
|---|---|
| Cost of Raw Materials, Supplies, Sustaining Program Talent, Rent, Sales and Advertising; Payments to Associated Broadcasting Stations; Research, Administration, and Other Operating Expenses | $156,135,582 |
| Wages and Salaries to Employees | 86,534,505 |
| Depreciation and Amortization | 5,925,235 |
| Provision for Post-War Rehabilitation and for Other Adjustments of War-time Costs | 2,955,000 |
| Interest | 1,945,539 |
| Taxes | 30,847,049 |
| Dividends to Stockholders | 5,953,623 |
| Carried to Surplus | 4,238,829 |
| Total | $294,535,362 |

Throughout 1943, the report states, complete cooperation existed between management and workers. On December 31, 1943, RCA personnel numbered 40,553, an increase of 4,966 over the preceding year-end. Of this number 19,652 or 48 per cent were men and 20,901 or 52 per cent were women. At year-end, 5,918 RCA employees had joined the armed forces, and 32 of them had given their lives to their country.

With the report to stockholders, announcement was made of the annual meeting to be held on Tuesday, May 2, 1944.




A. G. ZIMMERMAN (RIGHT), INDIANAPOLIS PRODUCTION MANAGER OF 16 MM. PROJECTORS, CONGRATULATES FOREMAN MAX HEIDENREICH AS THE LAST ITEM OF A LARGE SIGNAL CORPS ORDER IS SHIPPED AHEAD OF SCHEDULE. AT THE LEFT ARE B. E. CLATWORTHY AND C. M. PURDY.

# Photophone at War

## *MOTION PICTURE SOUND RECORDING AND REPRODUCING EQUIPMENT SERVING ARMED FORCES IN TRAINING CAMPS AND BATTLE FRONTS*



By Barton Kreuzer

*Manager, Photophone and Sound and Picture Sections, RCA Victor Division*

SOMEWHERE in the European theatre of war, two American boys, members of a bomber crew just back from a mission, are sitting in a canteen at their base, drinking coffee. They're not talking much—just sipping the steaming coffee and staring into space. They're dog-tired, but not sleepy. Nerve strain makes you weary and wide awake at the same time. Perhaps they're thinking about the fellows who didn't come back.

It's an easy guess for the captain that they're living the battle over again—and he knows that once is enough to live through any battle. He walks slowly over to their table, starts a conversation, but it lags. Then, glancing quickly at his wrist watch: "Say, we're late for the movie! You fellows coming?"

That does it!

For the next two hours this trio and most of the other men off duty at the base forget the bombing mission and all the rest of the war as they lose themselves briefly in the music, comedy, romance, and drama of an American motion picture.

* * * *

In Italy, an Allied armored division is girding for a major blow against an intrenched enemy force. Supplies of a new piece of fighting equipment, vital to the success of the campaign, have just arrived. Operation of the new equipment is complex. Large numbers of men must be trained quickly to handle it in the most effective way. A sound motion picture film, shipped in with the equipment, does the job.

Scores of men at a time, gathered before a movie screen, are enabled to see the equipment in action while they listen to a running description of the action by an expert instructor. Close-ups give them a detailed view of small operating parts as the instructor's voice explains each detail. Synchronized sound and pictures bring to large groups at one central point an understanding of the equipment which otherwise could only be had from individual instruction and field demonstrations.

* * * *

At a huge training camp in the Middlewestern United States, a bunch of new inductees is being assigned to quarters, stowing away luggage, being shown around by older hands. ". . . and over there," says a lad who's been there for a month, "is the post theatre—but don't think it's all Betty Grable.

"We have Hollywood pictures in the evening, sure; but we also have training films. You fellows are going to find that sound movies play a mighty important part in teaching rookies how to fight a war—and fast!"

* * * *

A new force is taking over a tiny island in the South Pacific. No fighting here—just waiting. Some of the new men are already homesick. One of them speaks to a member of the old force which, after months on the island, is being relieved. "Look," he says, "waiting can be a lot worse than fighting. What does a guy do when he decides he wants to spend the weekend at home?"

"Nothing to it," replies the veteran. "We got a crystal ball. You just look into it, and there's home—you can see it and hear it. No, wait a minute! I'm not kidding. I mean the sound movies they send down to us. Without them, I guess we would go nuts; but, believe me, they make it a lot easier."

* * * *

In Washington, a group of military strategists is gathered in a small projection room. An official combat film is being screened. Effective planning must take into account the nature of the enemy's equipment, its performance in battle, the kind of tactics employed, and the strength and weaknesses, if any, of our own equipment and our own tactics when put to the test of actual combat. Here, by means of sound motion pictures, may be seen and heard vital records of such combat data, gathered from fighting fronts throughout the world.

* * * *

These sketches give only a rough

idea of the variety and importance of the work being done by motion picture sound recording and projection equipment in the war program of the United Nations.

A dramatic impression of the scope of this work, in which RCA products are playing a major role, may be gained from recent government reports, as quoted in leading film trade papers. It was revealed by these reports, for example, that the latest Hollywood movies are now being seen by an average of 630,000 overseas men in uniform each night in all theatres of the war.

The figure was based on data obtained from a survey of attendance at 1,269 motion picture shows presented the night of October 1 at Army camps around the world Attendance figures ranged from 15,000 in an open-air amphitheatre in New Guinea to 11 men in an Alaskan outpost.

It also was reported that American forces in the Aleutians are being shown 125 film shows daily. There is at least one 16mm. projector on each island occupied by U. S. forces, according to this report, with a total of 63 on the Aleutian chain.

In the field of training films, it was stated that copies of nearly 2,000 such films from the various military forces of the United Nations have been assembled in Washington, D. C., by the United Nations Central Training Film Committee.

The Photophone Section and the Sound Picture Section of the RCA Victor Division are gratified by the extent to which the performance, durability, and other qualities of RCA equipment have been recognized by the armed forces and other branches of our government and the governments of our allies in their selection of the means to carry on this important work.

For U. S. Army use alone, RCA has supplied more than five hundred 35mm. sound film projection equipments and several thousand 16mm. sound film projectors, and delivery is being made on more than 150 portable recording equipments.

In addition to these equipments, in use in training camps, recreation centers, and base hospitals throughout the United States, and on fighting fronts throughout the world, more than a score of RCA film, sound and projection equipments have been furnished for special government installations in Washington, D. C. These included one in the White House for the use of the President and his advisers, and others for the Navy Department, the Army and Navy Staff College, and the Army War College.

### *RCA Supplies Equipment*

Of the several thousand 16mm. sound projectors supplied by RCA thus far this year to the armed services, a large proportion has been destined for use on various fighting fronts and at bases overseas. These projectors are used to show both training and entertainment films for units "on the march" or at bases where 35mm. installations are not feasible. An important use of these equipments abroad has been in providing quick, effective, visual instruction for combat troops.

RCA studio recording systems and mobile recording units have been furnished to government recording studios in Washington; Anacostia, D. C.; Astoria, L. I.; Wright Field; and Hollywood.

In addition to manufacturing the various types of equipment and supervising installations, RCA has assisted in the training of operating personnel and in furnishing continuing maintenance and repair services.

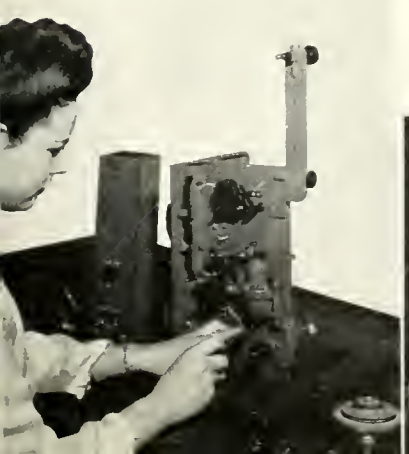
But even the imposing list of RCA film sound equipments being used by United States armed forces and government agencies at home and abroad does not encompass all of the broad field in which such equipment is contributing to the United Nations' undertaking.

Further bolstering the training and morale programs of the democracies, is the motion picture sound equipment which has been supplied by RCA Victor's International Department to various foreign governments.

This includes large quantities of both recording and reproduction equipment supplied to the English government through RCA Photophone, Ltd., of London, and to the government of India through Photophone Equipment, Ltd., of Bombay; quantities of recording equipment furnished for the use of the Russian government; and reproduction equipment furnished to the Dominion of Canada, and, through RCA Photophone of Australia, Pty., Ltd., of Sidney, to the government of Australia.

Equipment has been especially designed to meet conditions under which it must operate. Portable projection outfits supplied to Australian military forces, for example, have been fashioned to permit maximum adjustability to local requirements, easy dismantling, and parts-within-parts packing. This has facilitated the movement of these "theatres on wheels" over thousands of miles of rough country, and their operation at great distances from sources of replacement.

Unit stands are of tubular metal, so constructed that one section fits







LEFT: ONE OF THE THOUSANDS OF GOVERNMENT-ORDERED 16 MM. PROJECTORS IS SHOWN ON THE INDIANAPOLIS ASSEMBLY LINE; BELOW: SOUNDHEAD GEAR BOX SUB-ASSEMBLY AND HIGH-POWER AMPLIFIER EQUIPMENT RECEIVING FINAL TOUCHES BY GIRL EMPLOYEES.

within another. Soundhead and projector are in one unit. The screen frame is of metal tubing, in eight sections which permit folding. To provide for varying conditions in different localities, the equipment is provided with a series of lenses. The equipment has been transported over most of the Australian continent with negligible breakage.

These mobile "vans" have become welcome and familiar sights to fighting men in even the most remote Australian camps and bases. Attendance is always high, and as many as 5,000 troops have been entertained at a single out-of-door screening.

### *New RCA Projector*

Of particular interest among developments in design and construction which have been nurtured by wartime requirements is the new RCA 16mm. projector now being produced to meet revised government specifications. The new projector, which is an adaptation of a commercial model, is shock-mounted on rubber in a tough plywood case.

The armed forces specify that the projector must function properly after being dropped from a carrying position at a height of 18 inches onto a concrete floor. Dropped from this position it would strike on the bottom surface of the carrying case.

During a recent demonstration for company officials at the RCA Victor plant in Camden, N. J., the projector was set up on a table standing three feet above the floor, and a length of film was shown. Then, with the reel arms folded in and the case closed, but with the projector's six tubes, three lamps, and photocell still in their sockets, the projector was shoved off the table, dropping three feet and striking on a corner of the case. It was then set up again and another film was shown, demonstrating that no damage had been suffered either by tubes or mechanical parts.

The entire projector must also pass rigid tests assuring smooth, efficient operation under extremes of temperature, humidity, dust, and other factors of environment which may be encountered on the fighting fronts.

Other innovations in projection design include an arrangement which facilitates removal of the amplifier unit for servicing, use of special tube clamps to hold tubes firmly in place during transportation, and incorporation of a rotary stabilizer, such as is used in standard 35mm. Photophone theatre projectors, to provide the smooth movement required for high fidelity reproduction of the sound track.

AS ONE OF THE FINAL CHECKS GIVEN COMPLETED PROJECTION UNITS, THIS GIRL IN THE RCA VICTOR DIVISION PLANT AT INDIANAPOLIS GIVES THE MACHINE AN OPERATION TEST.





FRANK R. DEAKINS

## HEADS CANADIAN FIRM

FRANK R. DEAKINS, whose career parallels the development and expansion of the radio industry, has been named President of RCA Victor Company, Ltd., of Canada, subsidiary of the Radio Corporation of America.

Mr. Deakins rejoins the Canadian company in which he held the position of executive vice president from 1932 to 1934. He will direct the activities of more than 3,300 persons employed in the manufacture of radio and electronic equipment for the wartime needs of the Canadian government.

The new president of Canadian RCA Victor is a native of Jasper, Tenn., and was graduated as an electrical engineer from Alabama Polytechnic Institute.

Mr. Deakins first became associated with the radio industry when he was with the General Electric Company. He rose to become the sales manager of the radio department. He joined RCA in 1930 as assistant to the president.

He was made manager of RCA's Engineering Products Division in 1931 and the next year joined RCA Victor Limited of Canada as executive vice president. He returned to RCA Victor, Camden, in 1934 to become manager of the special apparatus division. Since the entry of the United States into the World War, Mr. Deakins has been executive assistant to the general manager.



ENGINEER MURIEL KENNEDY, OF NBC, GETS FIRST CHANCE AT THE CONTROL BOARD FOR PRESENTATION OF ALL-WOMAN SHOW "NOW IS THE TIME". MEN IN NETWORK OBSERVE STRICTLY "HANDS-OFF" POLICY.

# WOMEN PRESENT NBC SERIES

***Network Achieves Another "First" with Four Lively Feminine Dramatizations as a Tribute to Sisters-at-arms in Services***

UNPRECEDENTED in the annals of NBC's numerous "firsts" is the all-woman production of "Now Is the Time." This series of four dramatizations, prepared entirely by the distaff side, is a tribute to their sisters-at-arms in the WAC, WAVES, SPARS and Women Marines and is heard on four Saturdays from 9:30 to 10:00 a.m., EWT, March 25 through April 15.

Impetus for this exclusively feminine treatment came when William Burke Miller, NBC's war program manager and manager of the public service department, turned the project over to Jane Tiffany Wagner, NBC's director of war activities for women, with a hands-off-for-the-men, God-bless-the-women-directive.

Miss Wagner, who is also the current chairman of the Women's Activities Division of the Women Directors of the network, promptly assembled women representatives of every department at NBC and the designated feminine representatives of the Armed Forces. When plans had been coordinated, personnel of the network stations and representatives from the Armed Forces assembled in station studios throughout the country for a closed circuit talk given from Washington by Captain Mildred McAfee, director of the Women's Reserve of the U. S. Navy; Major Catherine R. Goodwin, WAC staff director for Army Service Forces; Miss Wagner and Mrs. Irene Kuhn, assistant director of information at NBC.

Plans went apace from then on, with women representatives of stations of the networks indicating their enthusiastic approval and cooperation.

From the engineering staff came Muriel Kennedy as control-room engineer, and from sound effects came Marjorie Ochs. Nancy Osgood, who directs "Consumer Time" from NBC—Washington, came on to New York for the directorial assignment. An all-girl orchestra is providing the musical backgrounds for the dramas and for service songs. The 300 guests at each broadcast are ushered into Studio 3B by girl members of the guest relations staff.

### *Assistants Are Named*

Assisting Miss Wagner in the undertaking are: Margaret Cuthbert, Doris Corwith and Marjorie Loeber, public service; Peggy Myles, Jean Harstone, Janet Lane, Claire Hyland, Lucy Towle, Anita Cleary, promotion and advertising; Irene Kuhn, public relations; Anita Barnard, public information and NBC speakers bureau; Phyllis Oakley, station relations; Angela Caramore, traffic; Ruth Ann Brooks and Ruth Manley, script coordinators; Alberta Hackett, production; Bertha Brainard and Helen Shervey, program; Sylva Fardel, music; Helen Bernard, recording; Sue Cretinon, news and special events; Jane Waring and Priscilla Campbell, press.

Priscilla Kent's scripts, which are narrated by Ernesta Barlow (NBC's "Commando Mary"), use the fact-in-fiction method of dramatized presentation in the hope of clarifying in the public mind many misconceptions about the work done by women of the services.

Emphasis is placed on the overall picture of what all four services accomplish jointly rather than on singling out differentiations between one branch and another. NBC hopes, by this dramatized approach, to make recruitment attractive to potential members not only on the basis of patriotism alone, but also because enlistment offers them a change of scene, contact with stimulating new personalities and training in skills which will improve their economic status in the post-war world.

## U. S. AND ITALY LINKED BY NEW RCAC STATION

*First American Owned, Operated Commercial Radiotelegraph Station in Europe Opened February 1.*

SPANNING land and sea in a direct 4,300-mile route between Italy and New York, the signal of Station X—now signing "ICA"—reached the receiving central of R.C.A. Communications, Inc., Riverhead, Long Island, just after sundown on January 29. The test paved the way for the official opening, three days later, of the first all-American owned and operated commercial radio station in Europe. All personnel of the station, including technicians and operators, consists of highly skilled American employees of RCAC, which opened the new radiotelegraph service with the assistance of the Army Signal Corps and at the request of the War Department.

One of the first messages to be transmitted was that of William A. Winterbottom, Vice President and General Manager of RCAC, to the station's manager, Thomas D. Meola, of Skaneateles, N. Y., who arrived in Italy last December 17 to supervise the job. The message read:

HEARTY CONGRATULATIONS TO YOU AND EACH OF YOUR SEVENTEEN ASSISTANTS ON THE REMARKABLE JOB YOU HAVE ALL DONE IN GETTING THE STATION WORKING IN SUCH SHORT TIME AND UNDER PREVAILING CONDITIONS STOP WE HAVE ALL FOLLOWED YOUR WORK WITH GREAT INTEREST AND YOU MAY BE SURE THAT WE AT THIS END WILL DO EVERYTHING POSSIBLE TO HELP YOU KEEP RCA PROMINENTLY ON THE NEW MAP OF EUROPE.

Expansion of the new service to handle Expeditionary Force Messages (EFM) to and from American troops and other official personnel in the Italian war area, in addition to government and press communications to which it at first was restricted, was announced by RCAC on February 17. All messages must bear the APO number of the addressee, and they may be filed at any telegraph office in the United States, marked "via RCA."

The EFM service comprises special forms of standard text radiotelegraph messages, made available through the cooperation of American military authorities to members of the armed forces overseas and to their families and friends at home. More than 100 pre-arranged texts are available, and the sender may select up to three of them in composing his message.

While present equipment of Station ICA includes facilities for transmitting radiotelegraphy and voice programs for rebroadcasting over American radio networks, RCAC officials have disclosed that some time soon there will be installed radiophoto equipment to transmit war photographs for the American press. When this service starts, pictures can be sent from Italy, as they are by RCAC from other war theaters, to the United States in approximately ten minutes.

## NBC, 3 UNIVERSITIES PLAN RADIO INSTITUTES

*Northwestern, Stanford, California Cooperate in Summer Courses on Broadcasting Arts for Newcomers.*

THREE of the nation's leading universities again will collaborate with the National Broadcasting Company to sponsor Summer Radio Institutes in 1944, it was announced recently in a joint statement by Judith Waller and Jennings Pierce, directors of public service for the NBC Central and Western Divisions, respectively.

This will make the third successive year that the network has pooled its resources with educational institutions to give practical training in the broadcasting arts to young people seeking careers in radio. The Institutes will be held at Northwestern and Stanford Universities and the University of California at Los Angeles.

Oldest of the three schools is the NBC - Northwestern University Summer Radio Institute, which was launched in 1942 on an experimental basis. This pioneer method of radio education was so successful that two additional Institutes were started on the West Coast in 1943. In the last two years, more than 400 students have been trained at the Summer sessions and absorbed by the radio industry and allied fields. The demand for graduates has far exceeded the supply.

As was the case last year, the three Institutes will have as their specific aim the training of students to serve as replacements, thereby alleviating the serious shortage of manpower existing in radio as a result of the war. Courses will carry full university credit and all applicants must have at least two years of college work or previous radio experience.

### *Textbooks Are Prepared*

The NBC-Northwestern Institute will be held during the period between June 26 and August 26.

Serving with Miss Waller on the board of directors of the Northwestern Institute are Armand Hunter, acting chairman of the Department of Radio, School of Speech, Northwestern, and Al Crews, NBC dramatic director.

Instruction at this year's Institutes will be facilitated through use of four text books, prepared by two of the directors and published by Houghton Mifflin Company. Miss Waller has authorized a survey book on radio and the other three treatises, devoted to Production, Writing and Announcing, were written by Crews.

Courses to be offered at the Northwestern Institute and their instructors are as follows: Introductory Course to Radio, Miss Waller; Announcing, Paul Knight, private teacher of speech, and William Kephart, NBC chief of announcers; Newswriting, John Thompson and Baskett Mosse, NBC news editors; Program Planning, John Simpson, NBC musical production director; Control Room Technique, Beverly Fredendall, NBC engineer; Sales Problems, Lou Tilden, NBC local and spot salesman; Continuity Writing, William Murphy, NBC continuity editor, and Dramatic Writing, to be taught by Crews.

# First Television in South America

*SELF-SCHOOLED URUGUAYAN RADIO TECHNICIAN, MARIO GIAMPIETRO' USING RCA ICONOSCOPE AND KINESCOPE, WINS OFFICIAL RECOGNITION FOR VISUAL BROADCAST EXPERIMENTS IN MONTEVIDEO*

HOME-MADE television equipment developed in the face of wartime technical handicaps has earned for Mario Giampietro, a youthful, self-schooled radio technician, recognition as South America's television pioneer.

Giampietro, radio tinkerer in Uruguay since 1924, has staked out a claim of being the first South American to broadcast visual images successfully over distances of more than a mile.

A conspicuous exception to the time-honored assertion that "a prophet is not without honor save in his own country," unassuming Giampietro has received official recognition from the Uruguayan Government, which granted him an experimental wave length and authorization to use CXHAQ as his call letters.

Financially supported by banker Juan Carlos Lasa and electrical technician Domingo Pereya, the video pioneer from south of the border climaxed his extensive experiments recently when he transferred his equipment from his own modest workshop in downtown Montevideo to Uruguay's Congressional building, for the first successful exhibition of television broadcasts in South America.

### *Trials Are Impressive*

The trials were so impressive that progressive Radio Carve, Uruguay's largest broadcasting station, immediately took Giampietro under its wing and is now reported to be planning a commercial company to finance further experiments, including one in which Giampietro wants to keep details secret for the moment.

This hush-hush experiment is said to be a revolutionary idea for broadcasting three-dimensional images. Giampietro and his aides are saying little about it, on the grounds that the idea is still in its earliest stages. But there is no mistaking the hopeful gleam in his eyes when Giampietro insists that it is a definite possibility.

The war has created many challenging problems for Giampietro in his television experiments. For one thing, the usual scientific data available to him before Pearl Harbor has been stopped under war secrecy measures. He has been hindered, too, by the scarcity of materials—or the complete lack of them.

### *RCA Tubes Are Used*

Reluctant to postpone his investigations until more advantageous postwar times, Giampietro has had to resort to many home-made parts, including specially-built bakelite insulators to take the place of unavailable lucite ones.

He is grateful, though, that he has been able to work with some of the most essential equipment—all-important RCA Iconoscope and Kinescope tubes, as well as a few condensers and resistors, obtained prior to the war.

Giampietro based the design of his home-made equipment on blueprints RCA issued before the war. In some details, however, he has had to work out ingenious changes because of technical differences. For example, the scanning system which RCA based on circuits of sixty cycles, had to be altered to conform with Montevideo's current of fifty cycles.

The scanning system which he now uses permits him to broadcast outdoor scenes of 440 lines, although interior images have usually been confined to 220 lines. In one experiment he utilized fluorescent tubes to illuminate night scenes. The fluorescents were satisfactory, Giampietro reports, despite their limited intensity.

Giampietro, an employe of the Uruguay Congress, is now using 115 megacycles, but his experimental station is scheduled to change to a commercial wave length of 52 megacycles in the near future. He claims his images, broadcast from an antenna placed only sixty feet above street level, have been picked up clearly by amateurs more than a mile away. Blocked on one side by tall neighboring buildings, signals can be picked up only south of the transmitter, he reports.

Raoul Fontaina, Radio Carve's president, who recently made a trip to the United States, says Giampietro's experiments "not only showed worthiness but convinced Carve that trials should be continued, with increasing likelihood of commercial use.

"I have seen experiments in the United States," says Mr. Fontaina, "and understand that despite the fact that Giampietro is using comparatively primitive equipment, it is considered as the basis for very promising future work."

Looking forward to the end of the war, Giampietro hopes to obtain new equipment from the United States and to receive data on experiments which he feels sure are being made under the cloak of war secrecy.

When, decades in the future, the history of television's development is set down on the printed page, South America's contribution to the magic of sight-and-sound may well carry the name of an unassuming, trail-blazing pioneer—Mario Giampietro.

## RCAC Opens New Office

On February 1, R.C.A. Communications, Inc. opened its newest branch office in the lobby of The Waldorf-Astoria in New York, making immediately available to guests of the hotel RCA's worldwide radio-telegraphic service. Mr. Frank W. Shaw, Manager of Agencies for R.C.A. Communications, Inc., has general supervision of the new office.

# RESTORATION
*of*
# TELEGRAPH COMMUNICATION
*with*
# THE LIBERATED COUNTRIES OF EUROPE
*via*

RCA



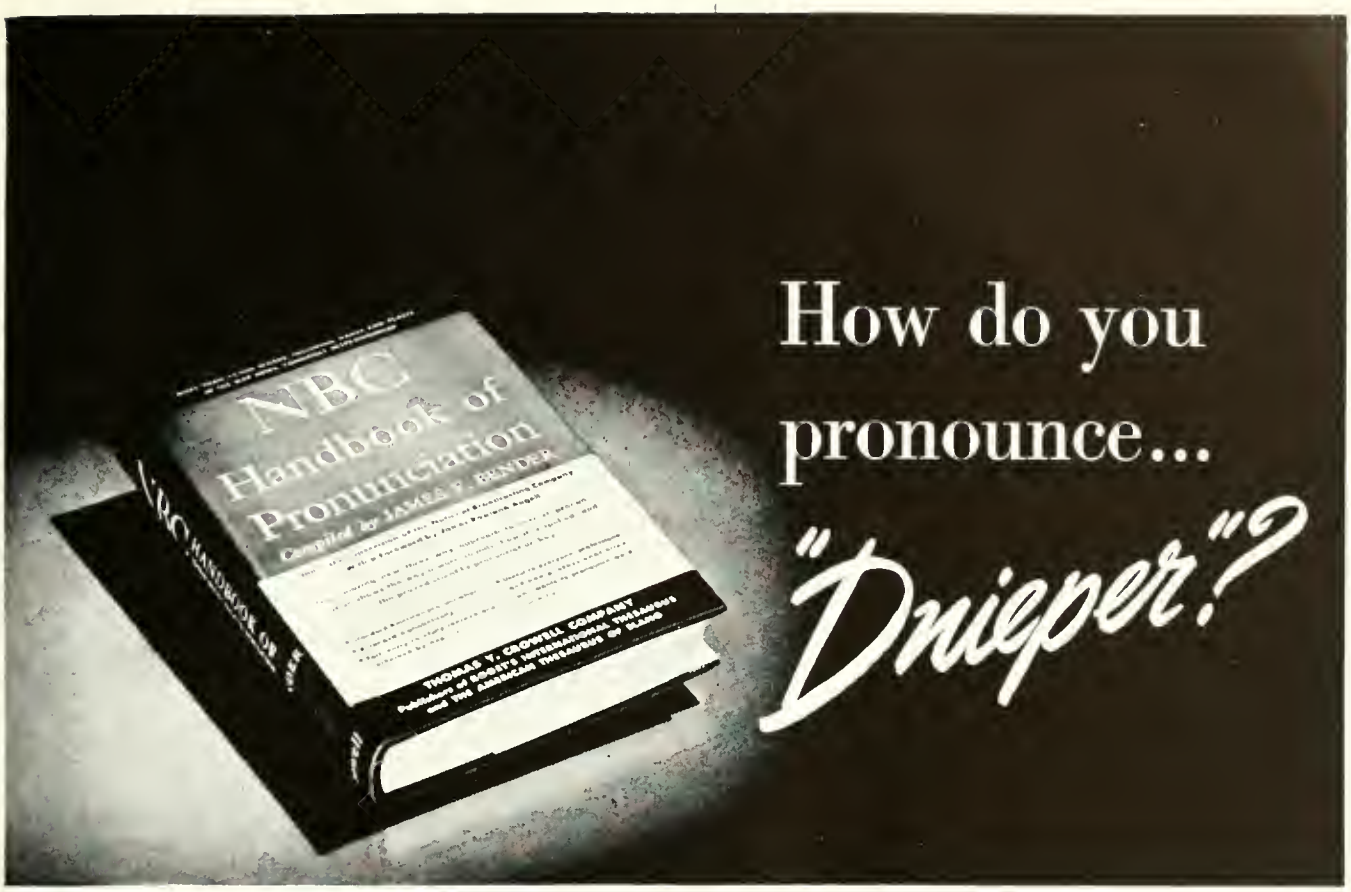
Until further notice, service is restricted to messages addressed to Military Personnel.

# No.1 ITALY

**R. C. A. COMMUNICATIONS, INC.**
A SERVICE OF RADIO CORPORATION OF AMERICA

64 BROAD STREET—*Telephone* HAnover 2-1811

| | | |
|---|---|---|
| 1 Produce Exchange | 132 Franklin Street | 405 Lexington Avenue |
| 67 Wall Street | 45 East 17th Street | 30 Rockefeller Plaza |
| 120 Cedar Street | 275 Fifth Avenue | 7 Central Park West |
| 39 Park Row | 1 East 44th Street | Hotel Waldorf Astoria |




Is it "D-nee-per" or "D-ny-per" or "Neeper"?

And what about "amenable"?

Are you sure how that one goes?

* * *

Well, NBC announcers are . . . they have to be.

Why? Because the National Broadcasting Company insists that nothing be left undone to increase listeners' enjoyment of its programs . . . step up the quality . . . avoid irritating distractions. With that in mind, "The NBC Handbook of Pronunciation" was compiled especially for NBC by James F. Bender, eminent American authority on speech.

This painstaking effort to see that words receive the same pronunciation—the *correct* one—is just an example of the extent to which NBC goes to please you.

Conceivably, each of the millions of NBC listeners has his own particular reasons for listening to NBC programs.

But, whether it's the voice of a favorite crooner, the jokes of a favorite comedian, the music of a favorite orchestra—or the correct pronunciation of Dnieper (NEE-per)*

this nation-wide acceptance of NBC programs by millions puts a nice point on NBC's constant drive for perfection in "little things."

It's the total of these "little things" that has made NBC *"The Network Most People Listen to Most."*

*From "The NBC Handbook of Pronunciation."

**Stay tuned to the**

# National Broadcasting Company

**It's a National Habit**

America's No. 1 Network

NBC

A Service of Radio Corporation of America



# *Yehudi Menuhin*... "LIKE A VINEYARD ON VESUVIUS"

"Yehudi is like a vineyard on the top of Vesuvius. There for that elephant all powerful and still ... that instrument is the violin. Under Yehudi's perfect self control are his emotions ... rising above performance." Thus Yehudi Menuhin is described by his great mentor and sponsor, Georges Enesco.

You feel what Enesco means as you hear Menuhin's superb performances on Victor Red Seal Records. His technique is unsurpassed. But he expresses the beauty of the music with warmth, sincerity, color and fire.



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# RADIO AGE

RESEARCH · MANUFACTURING · COMMUNICATIONS · BROADCASTING



RCA

JULY

1944



# THREE BELLS FOR ADANO

Hundreds of Adanos, known by other names and scattered throughout the world, find daily consolation in bells the Axis hasn't been able to silence —the NBC chimes.

Every night and day of the year, America's best-known radio signal rings through friendly and enemy countries alike, carrying hope among the downtrodden...sounding a warning to this nation's enemies . . . echoing a welcome and familiar note to Americans fighting abroad.

An Italian prisoner now in the U. S. writes: *"When I think how the voice of NBC brings daily comfort to so many Italians suffering in the homeland under the German heel, I should like to shake your hand."*

Long before Hitler marched into Poland, NBC began broadcasting in six languages over two powerful international short-wave transmitters beamed to various parts of the world. Countless hundreds abroad learned to rely on NBC for news and entertainment.

Pearl Harbor marked the beginning of increased, and ever increasing co-operation between the Government and NBC. Its International Division became a hard-hitting front-line weapon in the field of psychological warfare.

* * *

NBC's international broadcasts began as an experiment . . . just one of the many types of experiments NBC carries on constantly to maintain its leadership in radio. It is the results of these experiments . . . experiments in many fields . . . which help keep NBC out in front, help make NBC *"The Network Most People Listen to Most."*

**They all tune to the**

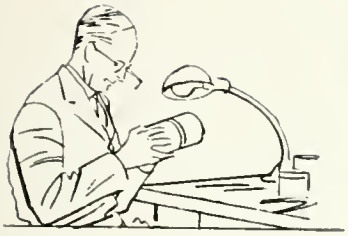
## National Broadcasting Company

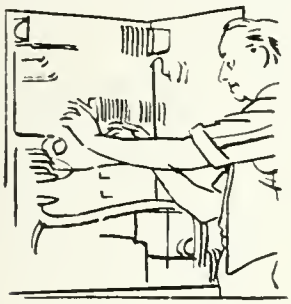
**It's a National Habit**

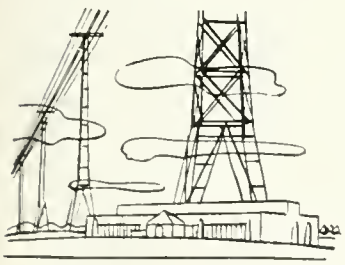
America's No. 1 Network

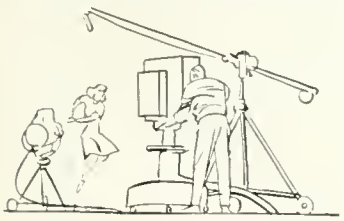
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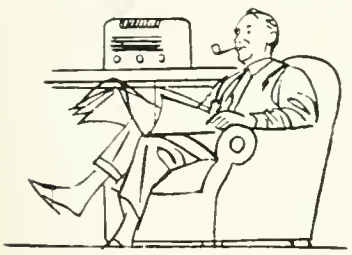
A Service of Radio











COVER: Old Glory shines forth as anti-aircraft men feed ammunition clips to a radio-directed Bofors—an inspiring kodachrome contributed by the U. S. Army Signal Corps.

# RADIO AGE

RESEARCH · MANUFACTURING · COMMUNICATIONS · BROADCASTING

VOLUME 3 NUMBER 4
JULY 1944

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STANDING IN FRONT OF THE RADIO STATION THEY ERECTED AT NAPLES, ITALY, FOR R. C. A. COMMUNICATIONS, INC., ARE, LEFT TO RIGHT, EDWARD FARNSWORTH, NIEL BECK, THOMAS D. MEOLA, AND ANDREW W. LONG. THE STATION HAS BEEN OPERATING IN AN RCAC DIRECT

# NBC Invasion Reports Win Acclaim

## GRAPHIC, COMPREHENSIVE COVERAGE OF D-DAY NEWS DRAWS CONGRATULATIONS OF AFFILIATED STATIONS — NETWORK IS FIRST ON AIR WITH EYEWITNESS ACCOUNT OF LANDINGS IN FRANCE



By William F. Brooks

*Director of News and Special Events*
*National Broadcasting Company*

FROM the first invasion flash and throughout a tense and solemn D-Day's dramatic unfolding of Allied strategy and might in the bold cross-channel sweep onto Normandy beachheads, NBC's fully-prepared and far-flung personnel and facilities passed their most challenging reporting test with flying colors.

In climaxing six months of extensive preparations for invasion coverage with one of the most complete and comprehensive reportorial jobs in the history of radio, NBC's news and special events departments in effect linked the fighting hearts of our striking forces across the Atlantic with the hopes and prayers of the home front.

Practically every minute of June 6 was devoted to giving the public a vivid and searching conception of what was taking place in the drive across the English Channel by the unparalleled Allied armada of ships and planes.

Thus did a prediction made nearly a decade ago by Col. David Sarnoff, President of RCA and Chairman of the Board of NBC, come true. Said Colonel Sarnoff on May 1, 1933, in an address at the Army Industrial College at Washington, D. C.: "Inventive resourcefulness may bring the full panorama of war to the instrument at our fireside."

D-Day found Colonel Sarnoff surveying the panorama of war at close range with the United States Signal Corps in England as Special Consultant to the Communications Branch of the Public Relations Office, Supreme Headquarters of the Allied Expeditionary Force.

Niles Trammell, President of NBC, long ago realized the magnitude of the invasion story. He knew that the nation wanted to know everything happening with the least possible interruption. Hence, soon after the first bulletin came in via German radio, he ordered every commercial broadcast, without exception, cancelled and to stay cancelled as long as there was a story to be told.

Numerous stations on the network, realizing the vast importance of the invasion, gladly sacrificed their commercial time for continuous coverage. On Tuesday evening, wires flooded the newsroom with congratulatory messages for the manner in which NBC was reporting the invasion.

Nothing was overlooked in an effort to give listeners a composite picture of what many have termed the greatest military action the world has ever known. From the time the AP machines sounded the five bells in the newsroom, shortly after midnight on June 6, until the flow of spot news began to die on the wires, NBC news and special events overlooked not a single detail in an effort to bring to the people a story in which it was vitally interested.

There were interviews with wives of military leaders on the front. Priests, ministers and rabbis came to the air to give their benediction to this cause of freedom. Government representatives in Washington were summoned to the air to give their reaction to this great military undertaking. Even the music, which was heard so seldom during the day, seemed to be played with a finite feeling, demonstrative of some momentous occasion.

### *Planned 6 Months Ahead*

Six months ago NBC's news and special events department began to lay plans for D-Day. London and Mediterranean staffs were augmented, and Francis C. McCall was later dispatched to the English capital to help Stanley Richardson, London Manager, coordinate the set-up and to see that the news was developed for broadcast consumption.

Seasoned reporters like W. W. Chaplin, John Vandercook, Merrill




ARMED WITH QUICKLY PENCILLED NOTES AND A MAP OF FRANCE, H. V. KALTENBORN, VETERAN NEWS ANALYST, IS ON THE AIR WITH NEWS FLASHED FROM THE INVASION COAST OF NORMANDY.





IN THE NBC NEWSROOM (LEFT), ROBERT BROWN AND WILLIAM F. BROOKS SCAN THE LATEST D-DAY BULLETIN. IN A LONDON OFFICE (RIGHT) COL. DAVID SARNOFF, PRESIDENT OF RCA, DISCUSSES WITH J. H. BBEBNER, DIRECTOR OF THE NEWS DIVISION, BRITISH MINISTRY OF INFORMATION, ADVANCE PLANS FOR HANDLING PRESS BY RADIO AND CABLE ON D-DAY. COLONEL SARNOFF IS ON ACTIVE DUTY WITH THE U. S. ARMY SIGNAL CORPS, ATTACHED TO SUPREME HEADQUARTERS OF THE ALLIED EXPEDITIONARY FORCE.

Mueller, a veteran of two previous invasions; David Anderson, George Y. Wheeler and Edwin Haaker were sent to the other side to aid Stanley Richardson and John MacVane. In addition, there were Tom Treanor, Los Angeles newspaper man who was assigned to the Coast Guard, Ruth Cowan, accredited to the Coastal Receiving Hospital, and Wright Bryan, Atlanta Journal managing editor, who is attached to the Naval Forces.

It was Wright Bryan who brought to England the first factual report of the actual invasion, and it was the first radio description to reach the airways.

There was no one man responsible for NBC's invasion coverage. From its top-notch reporter to the boy and girl who tore copy from the teletype machines, all worked as a well-oiled machine in bringing this spectacle to the news-hungry nation.

When the first broadcast flash came at 12:40 A.M., June 6, there were few people in the newsroom in Radio City. Even then, in view of the false report two days previous, caution was demanded. An announcer was summoned and a bulletin was flashed over the air. Then began the task of calling in all who were to work on the invasion, including Mr. Trammell.

Even though there was then no official confirmation from the Allied Supreme Command, the continual flow of bulletins of German derivation seemed to substantiate the original report. Within periods of several minutes, NBC gave the story to the public as it came from the press association news tickers.

### *Supervised Bedlam*

Robert St. John, veteran correspondent and one of NBC's ace commentators, was at a microphone a half-hour after the original report. Following him came H. V. Kaltenborn, dean of radio news analysts, whose coverage of the Munich crisis is still considered radio's greatest reporting job.

These men sorted out long bulletins at the microphones as the true invasion story gradually unfolded. Then came the official Allied confirmation at 3:30 A. M. By this time, the NBC newsroom was a scene of supervised bedlam. Adolph Schneider sat at the cue channel desk talking and on the other side of the Atlantic Ocean, in a small radio booth, he was being answered by those in charge of radio facilities there. He was arranging for broadcasts on D-Day action, and lining up stories which were later brought to the world. He didn't leave that room for eight solid hours, for as the action grew more intense his task became greater.

Bob St. John made a total of thirty-three broadcasts, ranging from two-minute bulletins to half-hour shows. H. V. Kaltenborn was equally active, as, without script but with his map before him, he gave the stories to the people of a listening nation, many of whom had sons in the very action he was describing. Kaltenborn gave a most dramatic picture, as, working only with notes, he unhesitatingly pieced together the battle action, describing each landing, how it was made and giving historical backgrounds where the landings took place. He could do this because he had been at the very spots where Allied boats scratched the sandy shore to dump their cargoes of men, arms and equipment.

When news tapered slightly in New York, NBC turned its point of pick-up to Washington, Cleveland, Chicago, Pacific Coast, Honolulu, Australia, Rome and other points around the Globe. Not once during the long hours of this invasion did this story lose its interest.

There were three interviews




DON GODDARD (LEFT), NBC COMMENTATOR, READS A D-DAY BULLETIN TO DE WITT MILLHAUSER, AN RCA DIRECTOR, MAJ. D. H. DWYER AND GEN. SIR THOMAS BLAMEY, COMMANDER-IN-CHIEF OF THE AUSTRALIAN IMPERIAL ARMY.

from Washington with wives of famous military men, including Mrs. Harold R. Stark, Mrs. Carl Spaatz, Mrs. James Doolittle and Mrs. Alan R. Kirk, and a message was read from Mrs. Eisenhower, wife of the Supreme Commander in Europe.

From the Senate gallery, Morgan Beatty, one of NBC's Washington correspondents, gave the news as it developed from the nation's capital. In the Senate gallery, he interviewed Senator Barkley, Senator Hill, Senator White and Representative Claire Booth Luce.

With Richard Harkness, Beatty was on top of every possible news story in Washington, and did the first broadcast from the Pentagon Building.

When it became certain that the invasion was actually under way, NBC made immediate preparations to bring to its microphones men from religious life to speak a word of inspiration and to voice a prayer for the preservation of those taking part in this military feat. There were Dr. Norman Vincent Peale, Rabbi David Poole, Reverend Francis X. Shea, Right Reverend William T. Manning, Episcopal Bishop of New York, Dr. Douglas Horton and the voice of the President as he led the country in prayer. Then there was a broadcast of King George's address to the men of the Allied Armies, which was part of NBC's invasion coverage.

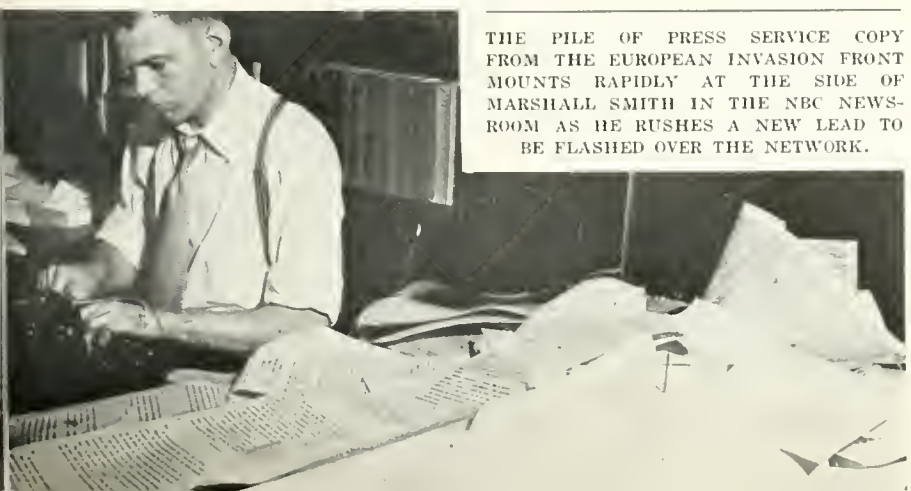
Other NBC newsmen who kept this life line of bulletins and stories on the air, were Don Goddard; Elmer Peterson, who recently returned from London, and Don Hollenbeck, who knows what invasion is, as he faced the German shore patrols at Salerno. Alex Dreier told his stories from Chicago, and from the Pacific Coast, Louis Lochner, who spent six months as a German internee, gave a background description of the German army and told how the landing would be successful.

### *Facilities Are Expanded*

When Hitler crossed his first border, NBC actually laid the groundwork for its world-wide coverage of news. Covering an invasion, or any great military action, goes beyond the realm of simple reporting. First there must be perfection of mechanical facilities; for, regardless of how good the story is, or of the risks involved in getting it, it will remain curled in the roller of a typewriter if there are no facilities to bring it to the waiting world of radio.

Months ago, when invasion was first a mere possibility, NBC set out to seek improved transmission facilities from the European theater of operations. At that time, there was one regular communication channel between the NBC News and Special Events Department and Great Britain. Contacts were made with the Army, the Navy, Censorship, RCAC, the AT&T, the British Post Office, which controls circuits out of England, the BBC and various officials in Washington and London who were charged with a part in the censorship and dissemination of news once the invasion started. In cooperation with the other networks the problem was explained and clarified. On D-Day, three communication channels linked American broadcasting headquarters in London with home offices in New York.

These new radio outlets enabled the radio audience to get a more complete picture of developing military action than was ever possible before. Background copy was prepared and ready both in New York and London. Special features were assigned for development both domestically and abroad. Prominent personages representing various countries in the occupied territories were approached, and made ready to broadcast once the flash on the invasion came speeding over the ocean.



THE PILE OF PRESS SERVICE COPY FROM THE EUROPEAN INVASION FRONT MOUNTS RAPIDLY AT THE SIDE OF MARSHALL SMITH IN THE NBC NEWSROOM AS HE RUSHES A NEW LEAD TO BE FLASHED OVER THE NETWORK.

In the NBC Newsroom in New York, the engineering staff did yeoman work installing a newly-developed control board to make for more perfect control of the network during news operational periods, regardless of their length.

Ordinarily there are four possible ways to cover a military operation:

First, by correspondents getting their stories with the troops and on the ships at the fighting front and sending them back to the main broadcasting points for transmission.

Second, by use of portable wire and tape recorders. This magic of radio has been instrumental in bringing some of the most dramatic stories of World War II to the radio audience. Don Hollenbeck used it in the Salerno invasion; Merrill Mueller had this device in the early stages of the Italian campaign, and Ralph Howard used it later when the Allied armies broke through the German lines in the push which drove the Nazis from Cassino to the outskirts of Rome.

Many of NBC's front line reporters were equipped for invasion with these recorders. While not new in radio, this equipment is still very much of a mystery to the average layman. The instrument weighs about thirty-five pounds, faced with a panel board on which are two spools. A wire (or tape) runs from one spool to the other. A reporter, using the wire recorder, speaks into a microphone and what he says is recorded on the wire. He can then reverse the spool, and what he has spoken is played back to him.

Our front line men carry the recorder into battle; tell the story of engagements from fox holes, from ships and from the air. They send the wire spools back to headquarters where censorship makes any necessary deletions, and then pass them on to NBC broadcasting points for the world to hear.

The third method of covering the invasion is possible only after definite and permanent landings have been made and fixed transmission facilities are available. The broadcasting setup in Naples was typical of this type of coverage. When the Allies took this city, there was no transmitter available. That condition existed until the Army Signal Corps and RCAC were able to set up a transmitter powerful enough to relay broadcasts back to another transmitter, which powered the reports overseas to NBC in New York.

### *From the Front Lines*

The fourth method of invasion coverage, and one of the most dangerous is by live broadcasting from the front lines. It necessitates a series of small transmitters and an equal number of transmissions. Such a broadcast was made from Bougainville by George Thomas Folster, intrepid NBC correspondent, with three men, covered by a sharpshooter, beyond the American lines, mike in hand, while wire was played out to him through the jungle undergrowth. Even as he spoke, gun fire broke out a bare 75 yards away.

In the NBC Newsroom in New York daily conferences were held with engineering, traffic, program, and sales department representatives. Standby programs were set up, new facilities were installed and ordered from commercial companies, and the news staff was drilled incessantly with the fact that NBC hoped it would be first with every break of important news but, more important, it wanted to be correct. Monitoring of Axis capitals was ordered up from R.C.A. Communications in both New York and San Francisco, and arrangements were made for emergency cots and meals for the 24-hour shifts expected for the staff.

Back of the on-the-spot NBC reporters were the immense facilities and staffs of the British Broadcasting Corporation, with whom NBC made exchange arrangements for coverage, and, of course, the immense staffs of the three great American press associations — the Associated Press, the United Press, and the International News Service — whose world-wide reports are constantly available to the NBC news organization.

The role played by RCA equipment in the invasion on land, on sea and in the air was stupendous, but cannot now be told. The thousands of RCA workers surely experienced an added thrill on D-Day realizing the extent to which they may have participated in equipping the heroic Allied armada.

ADOLPH SCHNEIDER, ACTING MANAGER OF THE NBC NEWS DEPARTMENT, ON TELEPHONE AT LEFT, AND ARTHUR GARY, ON 'PHONE AT RIGHT, AWAITING A GO-AHEAD SIGNAL FROM LONDON. RIGHT—ROBERT ST. JOHN ON THE AIR.







DR. GEORGE H. BROWN GIVES THE PENICILLIN ELECTRONIC DEHYDRATING APPARATUS HE DEVELOPED IN RCA LABORATORIES A FINAL INSPECTION BEFORE IT IS SHIPPED TO THE E. R. SQUIBB & SONS PLANT AT NEW BRUNSWICK, N. J.

# AIDS PENICILLIN PRODUCTION

***Electronic System Developed in RCA Laboratories Completes in Thirty Minutes Evaporation Process Requiring 24 Hours by Conventional Methods.***

IMPELLED by recurring demands from American fighting fronts and homefront sickrooms for increased production of the renowned drug penicillin, the Radio Corporation of America has developed an electronic system that in 30 minutes completes an operation which requires 24 hours by the conventional system in the bulk-production of purified penicillin solution — a time-consuming step in production.

This achievement was announced jointly today by the RCA Laboratories, Princeton, N. J., one of the world's foremost centers of radio and electronic research, which has conceived radio-frequency concentration of penicillin solution, and E. R. Squibb & Sons, manufacturing chemists to the medical profession since 1858, under whose auspices extensive tests have just been completed.

Tests at the new Squibb penicillin production plant at New Brunswick, N. J., showed that in one day's operation a single RCA electronic apparatus had a potential capacity of concentrating penicillin solutions containing approximately 2,000,000,000 Oxford units. The speed of operation is about 48 times as fast as it is in one of the conventional "freeze-drying" machines. The number of units concentrated in 24 hours in an RCA electronic apparatus corresponds to approximately 20,000 ampuls, each containing 100,000 units—an amount sufficient to treat 4,000 patients requiring 500,000 units each.

Squibb scientists disclosed that during the experimental period starting on May 5, when the high-frequency equipment was installed, they conducted more than 1,000 tests to ascertain the relative effectiveness of the electronic system and the conventional method of concentrating this product. The advantages in using radio heat, aside from speeding the process, included:

1. Reduction in operating costs, equivalent to the saving of one ton of dry ice a day, or approximately $65 every 24 hours.

2. Reduction in maintenance costs through elimination of complicated freezing apparatus and high vacuum pumps.

3. Smoother flow of production, with less chance of shutdowns and other delays due to refrigeration and mechanical difficulties.

4. Reduction in floor space requirements by nearly 10 times, as the RCA equipment takes up about the space of an up-ended office desk.

In addition, RCA officials pointed out, the radio frequency equipment represents a large saving in initial investment, as compared with the installations required for concentration by freeze-drying, with single units of the RCA equipment tested at Squibb destined to be sold at about $6,000 which is several hundred per cent less than some of the present installations in use by the Nation's eighteen producers of penicillin.

Horace A. Holaday, Associate Director in Charge of Squibb Biological Laboratories, who supervised the tests, had this to say:

"On the basis of what I have observed, the RCA apparatus offers an important contributions in facilitating the evaporation of the final purified penicillin solution. It greatly simplifies the operation,

and eliminates the necessity of using much more elaborate equipment."

Individual credit for the development of the high-frequency dehydrator has been given to Dr. George H. Brown, 35-year-old research engineer, of RCA Laboratories, who was inspired in making his invention by a newspaper story he read on the production problems of penicillin, the demand for which, overseas and at home, has far exceeded the supply. He received helpful assistance from his associates, R. A. Bierwirth and Cyril N. Hoyler, and from scientists at the Squibb Biological Laboratories, the latter providing most of the penicillin solution for his experimental runs.

Dr. Brown's radio-frequency system deals directly with the problem of the bulk-reduction of purified penicillin, rather than with the production of penicillin itself.

After the penicillin is produced by the mold either by surface or submerged fermentation in containers holding up to several thousand gallons, the penicillin-containing broth is separated from the mold by filtration and the crude penicillin extracted from the broth with an organic solvent. It is then given an elaborate series of chemical treatments which finally remove most of the impurities and reduce the bulk by about 600 times.

This is the point where the final bulk-reduction must begin for, while the penicillin in solution now has a potency of about 40,000 units per cubic centimeter, the objective is to attain 100,000 units per cc. Once that is accomplished, the penicillin is freeze-dried to powder form in ampuls for shipment to places of urgency designated by the War Production Board.

Since ordinary heat methods of evaporation destroy the effectiveness of penicillin, the bulk-reduction in plants under WPB control has been achieved through freeze-drying, a process in which the penicillin solution is caused to evaporate in a high vacuum at below-freezing temperatures.

Dr. Brown's electronic bulk-reducer employs radio - frequency current to concentrate the penicillin solution. His system consists of three large glass bulbs, connected in vertical series, and attached to a pump that maintains a relatively low vacuum.

To the setup is connected a 2,000-watt radio - frequency generator. Electrodes carrying the output of the electronic generator are attached to the base of the lowest glass bulb which, when the unit is in operation, holds about 200 cubic centimeters of liquid.

As the vacuum pump starts, the suction draws the solution into the base of the lower bulb. The radio current is turned on and, as the current passes through the solution, heat up to 50 degrees is created and the liquid boils. This causes an evaporation at the rate of two litres an hour.

### *Laboratory Model Installed*

It was Dr. Brown's laboratory model, built in its entirety at RCA Laboratories, that was installed at the Squibb penicillin production plant on May 5. There its operation was observed both by Mr. Holaday and by Mr. C. W. Eberlein, superintendent of the plant, who after conducting exhaustive tests, announced they are ready to place it in steady production.

The apparatus occupies a floor space roughly 3 x 5 feet and is approximately $7\frac{1}{2}$ feet tall.

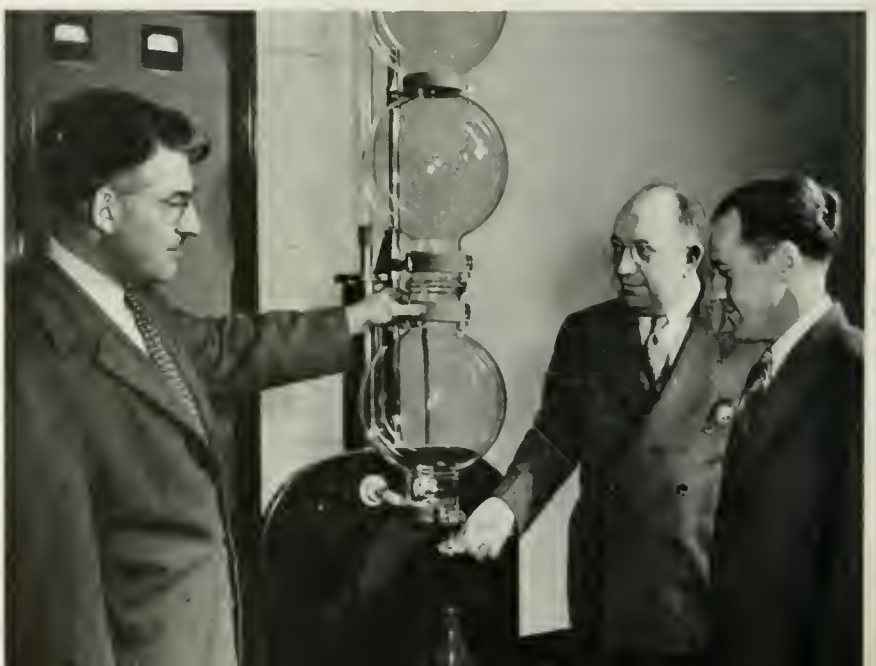
Electronic bulk-reducing equipment, based upon the model, will be manufactured and marketed by the RCA Victor Division, Camden, N. J.

In an interview, Dr. Brown recalled some of the problems with which he contended as he sought to perfect his invention. One of the difficulties that had to be overcome in the original setup of two connected glass cylinders was excessive foaming, which slowed up the process. The thought occurred to him that glass marbles placed in the connecting necks of the cylinders might be effective.

The scientist sent out a messenger, who visited all of the shops in the town of Princeton without so much as finding a marble. Dr. Brown called his home and enlisted his wife to search his children's belongings. Still no marbles. Finally, his wife reported that one of the neighbor's children, John Turney, who "played for keeps", had a shoe-box containing 1,000 glassies. This supply was tapped and science moved ahead.

Dr. Brown's final solution, however, was to replace the two glass cylinders and marbles with the three glass bulbs of his model, and add a water coil. Further, the penicillin was "degassed" before placing it in the containers. Dr. Brown explained that boiling occurs in the bottom bulb, the next bulb takes care of excessive foaming, and the third is "just for good measure."

CYRIL N. HOYLER (LEFT), DR. GEORGE H. BROWN, AND R. A. BIERWIRTH SHOWN WITH THE ELECTRONIC DEHYDRATER.



# Two New Microscopes

## RCA INTRODUCES IMPROVED UNIVERSAL MODEL AND CONSOLE INSTRUMENT AT MEETING OF AMERICAN BACTERIOLOGISTS



By Perry C. Smith

*Manager, Electron Microscope Design Section, RCA Victor Division*

AN HISTORICAL date was set in December, 1940, when RCA sold the first commercial electron microscope produced in this hemisphere. It is doubtful that the possibilities of this new tool for science were fully realized at the time of the original installation. Many predictions were made but little did anyone imagine what the electron microscope would and did accomplish in so many research fields in so short a time. Although many workers in various endeavors were revealing new wonders daily with the electron microscope, it was shortly after World War II began that electron microscopy received an impetus which advanced the art at an unbelievable pace and which permitted its name to become synonomous with the science of the war effort. The headline news which the RCA electron microscopes are making daily, unfortunately may not be told until the War is over.

However, it can be said that fifty-eight of the original model electron microscopes — the type EMB—have been produced and delivered up to this date. Likewise, it can be stated that the RCA electron microscopes have definitely won a place in the circle of recognized scientific devices.

Within a year after Dr. Vladimir K. Zworykin of the RCA Laboratories and his associates released the original research model electron microscope for production, it was realized that a product design and advance development group would have to be formed to handle production problems and to broaden and improve the equipment line. To this end, such an organization was formed in late 1941. Among other things, this group has trained hundreds in the art of electron microscopy; it has provided many improvements and attachments for the original design of microscope; it has set manufacturing standards and guided production processes.

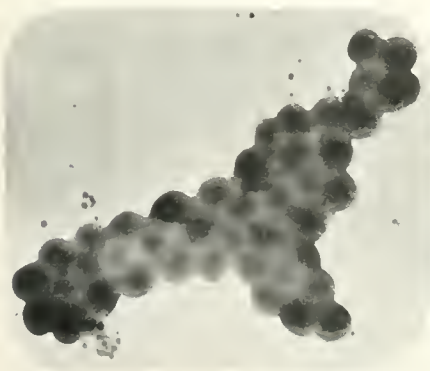
Early in May, 1944, another history-making event in electron microscopy took place when the RCA Laboratories and the Commercial and Industrial Engineering Departments of the RCA Victor Division introduced two new improved instruments before the American Society of Bacteriologists, meeting in New York.

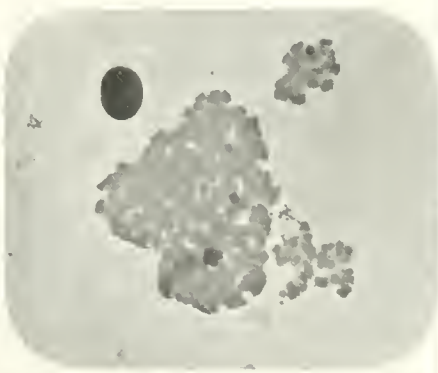
In designing these two new instruments, our Product Design Group was largely guided by the field performance of the EMB microscopes scattered throughout the United States and the more than 100,000 micrographs they have produced. The friendly and constructive criticism of the many technicians and associates using RCA microscope equipment was of incalculable aid.

The type EMU, or universal microscope, and the type EMC, or console microscope, were designed with the following main viewpoints for guidance: (1) operator comfort and convenience; (2) simplicity and flexibility; (3) consistent top performance; and (4) ease of maintenance.

Briefly, the RCA electron microscope is a device for studying and photographing the smaller particles of nature. These particles range in size from those observable with the light microscope down to single molecules. In fact, many of the larger molecules have already been photographed. The usefulness of the electron microscope comes from the fact that its resolving power—its ability to distinguish one small

THE NEW UNIVERSAL MODEL RCA ELECTRON MICROSCOPE (RIGHT) IS DEMONSTRATED BY THE AUTHOR (STANDING), DR. V. K. ZWORYKIN AND DR. JAMES HILLIER. THE TWO ELECTION MICROGRAPHS BELOW SHOW STAPHYLOCOCCUS AUREUS BACTERIA BEFORE (LEFT) AND AFTER BEING SUBJECTED TO PENICILLIN.







particle from another—is from 50 to 100 times greater than that of the ordinary light microscope. Resolving power increases in proportion to the frequency of the source of illumination. Thus the resolving power of a light microscope is limited by the available frequencies of visible illumination. Electrons, as used in electron microscopy, have wavelengths which may be 100,000 times shorter than the wavelengths commonly employed in light microscopy. The theoretical resolution obtainable with electrons has not by any means been realized. However, as in all science, perfection is only a goal, not a realization, and tomorrow's electron microscope will seek and find more than yesterday's.

### *Magnifications Compared*

The very high resolution of the electron microscope enables the instrument to work at useful magnifications that would have seemed incredible a few years ago. Useful magnification is the largest product of instrumental and photographic magnifications beyond which no further information is revealed to the eye. For the sake of comparison, the useful magnification of a light microscope does not exceed 2000 times, while the useful magnification of an electron microscope in most cases exceeds 50,000 times and may reach better than 100,000 times, depending on the type of material under examination.

The new Universal Electron Microscope provides three distinct services: straight two-dimensional micrographs; three-dimensional or stereo-micrographs; and diffraction patterns of crystalline substances. Two-dimensional pictures may be taken of particles, suspensions, films, crystals, etc., within the limits of the penetrating power of the electron beam, which is about 1 micron (1 25,000 of an inch). For those materials which are opaque to the electron beam—materials thicker than about 2 microns —valuable information may be obtained through *the use of the "replica technique" which was developed for this purpose.* This technique consists in casting a very thin film on the surface or area to be studied, stripping the film from the specimen, and photographing the film itself. The difference in thickness of the stripped film, caused by the irregularities of the surface of the specimen, cause the electron beam to register them and produce a facsimile of the original. Refinements of this technique have led to replica micrographs possessing resolution almost equal to standard micrographs.

### *Great Depth of Focus*

Stereo-micrographs are produced by taking two exposures of a given field. One exposure is made with the specimen tilted at a slight angle with respect to the electron beam while the second exposure is taken at an equal but directly opposite angle. When the two exposures are aligned properly and examined with suitable stereo viewers, third dimensions are readily observed and measured. Stereo-micrographs can be made of either standard micrographs or replicas. In appraising the extreme usefulness of electron stereo-micrography, it should be pointed out that electron microscope images possess a tremendous depth of focus—some 15 to 25 microns — whereas light microscope images have a depth of focus of something less than 1 micron for low magnifications and are proportionately shallower as magnification is increased. From the above it is apparent that the entire fields of electron stereo images are practically always in complete focus and the most intimate knowledge of bulk dimensions, arrangements and linkages are easily obtainable.

### *Used in Surface Studies*

Electron diffraction provides a means for studying the atomic geometry of crystalline materials. Electron and X-ray diffraction studies supplement each other in that electron diffraction is used for the study of surfaces and thin films and X-Ray for the thicker materials. This is brought about because of the difference in penetrating power of the two types of radiation employed. There are two techniques used to obtain patterns in electron diffraction studies; transmission method and reflection. Crystals in powder form are studied by the transmission method and, in these cases, powder smears or groupings are not opaque to the electron beam. Electrons simply are allowed to pass through the devious lattice structures of the random mounted crystals to produce a pattern. For those substances which are opaque or in bulk form, the reflection technique is used. In these cases the electrons are allowed to graze the specimen surface at a slight angle. Mechanical means are provided to properly orient the opaque specimens so that the crystal lattices are in proper relation to the electron beam.

Electron diffraction patterns are sometimes referred to as the "thumbprints" of the crystal universe. No two substances produce the same pattern. In practice, diffraction patterns are obtained to permit the study of the atomic geometry of a new substance or to identify an unknown substance by means of its pattern, checked against its thumbprint in file. The relative degree of crystallinity of a given substance is a further valuable contribution portrayed by dif-



AN ELECTRON MICROGRAPH OF THE SCALES OF A MOSQUITO WING MAGNIFIED 16,000 TIMES.

fraction patterns. Many applications are making use of this phenomenon for straight process control of product and ingredients.

Since an electron microscope is primarily a cathode ray tube which must be opened from time to time to atmospheric pressure to admit new specimens and photographic plates, careful consideration must be given to the vacuum system and its control. As the electron beam, used to illuminate the specimen, is rapidly absorbed and scattered by gas molecules, a relatively high vacuum must be maintained in the body of the microscope. Generally speaking, commercial and laboratory vacuum systems are quite complicated, consisting of a multiplicity of controls, valves and pressure indicating devices. Vacuum control —"rough" pumping, final pumping, "bleeding" to atmospheric pressure and all other sequences—are controlled by one simple valve crank in both of the new microscopes. Since the columns—or microscopes themselves—have been designed for minimum volumes and since the columns themselves are the only portions of their respective vacuum systems requiring pumping during operation, the time required between specimen changes has been kept to a maximum of about one minute and a half, and no air locks or auxiliary pumps are required.

### *Systems Are Simplified*

The electronic systems which control the accelerating voltage—and therefore the wavelength associated with the electron beam—and those which control the power of the electro-magnetic lenses of the new microscopes, are greatly simplified. For example, the Universal Microscope has only twenty-five vacuum tubes compared to the older B Microscope which had fifty-one. The Console Microscope requires only fourteen tubes for its operation. As a result, the new Microscopes require proportionately fewer circuit components and space and facilities for mounting them.

All electrical and mechanical controls have been designed and positioned for operator comfort and convenience — specimen movement, image intensity, magnification, focusing, power control, camera control, vacuum and circuit meters, are all within easy and convenient reach of the operator.

### *Occupies Small Space*

Mechanically, the new microscope columns are greatly simplified. Clamping rings, gaskets, Sylphon bellows, etc., which are essential parts of demountable and adjustable vacuum systems, have been reduced to a practical minimum. Whereas the EMB Microscope employed 22 Sylphon bellows, the Universal Model uses seven and the Console Model only three. Most of the Sylphon bellows were eliminated by design simplification but in certain cases, bellows have been replaced by a recently developed type of rubber seal. These new rubber seals permit rotary or reciprocating motion within the evacuated chambers and render months of continuous service without attention.

The Universal Microscope is intended for a fixed type of installation. The cabinet has been designed to occupy a minimum of floor space consistent with average allowable floor loading. The instrument may be mounted against a wall or free of any partition. Power, water and forepump connections can be made by way of floor trenching or fed through the right, left or rear of the bottom skirt of the cabinet. The only accessories external to the microscope cabinet are the fore pump and line voltage stabilizer which can be installed in an adjacent room or other nearby convenient location.

The Console Model has been designed for semi-portable usage. The desk type construction, whose dimensions allow clear passage through a standard thirty-inch door, fulfills the requirements for occasional mobility. The Console desk houses the fore pump and all other accessories except the line voltage stabilizer, which can be mounted at any nearby convenient location. A large amount of storage space is provided by the shelving unit built into the compartments at the right and left of the kneehole of the desk.

Both the Universal and Console Models of the Electron Microscope can be operated from standard socket power—110 volts. The Universal Model consumes 1,500 watts and the Console Model 1,000 watts. Both instruments have vacuum systems which pump their respective columns to better than one tenth micron of mercury.

The Universal Microscope has a direct magnification range of from 100 to 22,000 diameters, adjustable in forty steps. The Console Model provides two direct magnifications of 500 or 5,000 diameters. The photographic negatives produced by either microscope must be photographically enlarged to reveal all the detail present.

### *Development Continues*

Each day brings new discoveries and broadens the list of applications of electron microscopy. Keeping pace with this new science—the science of electron microscopy—is the RCA Product Design Group, among whom are such outstanding young engineers as Dr. Robert Picard, Samuel Zollers, Frank Runge and Miss Helen Muenscher. Advance development is proceeding on other electron optical devices related to the science, and each new product will perform new and useful service for mankind.



THIS NEW RCA DESK CONSOLE MODEL ELECTRON MICROSCOPE IS DESIGNED FOR EASE AND SIMPLICITY OF OPERATION. MINIMUM TRAINING IS REQUIRED FOR OPERATORS.

Buy War Bonds



HIDDEN FROM THE SKIES BY CAMOUFLAGE NETTING AND PROTECTED BY STACKS OF SANDBAGS, THE RCAC RADIO STATION AT NAPLES, ITALY, IS BARELY DISCERNIBLE IN ITS WOODLAND SETTING. RIGHT—EDWARD FARNSWORTH AT THE RECEIVER.



# RCAC OPENS ROME STATION

*New Radiotelegraph Service Links New York and Italian Capital in Direct Circuit—Equipment Installed by RCA a Week After City Was Liberated.*

DIRECT radiotelegraph service between New York and Rome, first of Europe's great war capitals to fall to Allied armies, was opened June 13 by R.C.A. Communications, Inc.

Employing radio transmitting and receiving equipment shipped by RCA from New York to Italy in anticipation of the liberation of Rome, the new communications circuit already is greatly facilitating the flow of press dispatches, and Government and military messages to and from the Italian war zone.



NIEL BECK TUNES A STANDARD RCAC DIVERSITY RECEIVER AT THE NAPLES STATION.

It supplements the direct service opened by the company between New York and Naples on February 1.

Following closely on the heels of the Allied occupation forces, a group of RCA engineers and operators under the supervision of Thomas D. Meola, manager of both the Rome and Naples stations, moved their American radio equipment into Rome and had it in operation just seven days after the Germans fled the city.

RCAC established the Rome station with the assistance of the Signal Corps, U. S. Army, at the request of and in cooperation with the U. S. Board of War Communications and U. S. military authorities. The Naples installation was the first wholly-owned American commercial radio station on the continent of Europe, and the Rome station is the second.

During the period from February 1 until June 13, when the Rome station was opened, RCAC won high praise for its Naples terminal from news organizations in the United States for overcoming difficulties in transmitting war news from the Italian front.

Reports reaching the RCAC offices in New York told of a remarkable feat in which engineers of the company installed the station from scratch in less than one month and began flashing on-the-spot news accounts at a rate as high as 240 words a minute. Transmission of news copy to the United States mounted steadily until the daily capacity of the station exceeded 75,000 words.

American war correspondents discovered that, once urgent messages were passed by censors, the dispatches reached press association offices in New York by RCA in less time than it took to compose them. "Flash" copy and urgent bulletins often made the journey in as few as three minutes.

# BUILDING HUMAN RESOURCES

*RCA Victor Personnel Administration Believes Planned Development of Employees' Abilities Is Important Factor in Postwar Industrial Success.*



By W. B. Dominick

*Personnel Administration*
*RCA Victor Division*

ECONOMISTS have predicted that a life and death struggle may be expected in the post-war period between well-established companies making the same kinds of products.

They also point out that, under the necessity of increased war production, many small pre-war businesses expanded tremendously beyond their normal fields and will be keen competitors of nationally known firms. Other companies distantly related in normal times are now prepared to compete in the same markets.

The end of the war and the resumption of peacetime production will undoubtedly find many of these war-born and expanded companies determined to remain in their new fields. This will surely bring more intense competition than ever known before.

In this predicted post-war struggle, perhaps the greatest promise for a company's survival lies in its *human resources*. To place this in its true perspective, we must remember that certain factors are relatively constant where competition is involved. For instance, a company cannot buy raw materials below market cost. It cannot buy machinery more cheaply than its competitors. It usually has to pay at least the same salary rates as its competitors in the community. And it cannot sell its products at prices too far out of line with those of competing firms. Under conditions of keen competition, profit margins are so narrow that even minute savings or improvements in efficiency can be of great importance.

*The one element which offers important opportunities for improvement and development in an industrial organization is the human factor.* Far-sighted industrial leaders agree that the success of an organization depends largely upon the individual well-being of every person in its employ. Much of this personal well-being stems from the employee's feeling of satisfaction in his job. This can be developed and strengthened through a planned program of training that increases his skills and prepares him for advancement in his work.

### *Accomplishments Listed*

What can good training accomplish? More than any other technique of management, effective training establishes good personal relationships, develops employees' skills and understanding of their work, prepares them for larger responsibilities, and clarifies the purposes of the organization through which they work cooperatively for the attainment of certain goals.

Just how productive a systematic training program can become is illustrated by one supervisor of an RCA plant who attributed a threefold increase in the value of the items shipped from his section principally to the inauguration of a systematic job training plan. This kind of result in a highly competitive market could very well mean the difference between success and failure.

Reconversion of manufacturing facilities to peacetime production will not diminish the need for good training. As long as we have employee turnover, promotions, transfers or any changes whatever in personnel, there will be need for training. *Just as long as industry is concerned with reducing waste and inefficiency, training will be as vital to management as any other phase of production.*

One of the training tasks that lies immediately ahead concerns the absorption of returning service men and women. This problem is already upon us, because a considerable number of these people are coming back every month. Many of them have developed new skills or gained experiences in the armed services that equip them for different or better jobs than they previously held. The training of supervisors to understand these ex-service men and women and to instruct them patiently and wisely is a task of first importance in formulating a postwar training program.

Another important training task concerns the reconditioning of the thinking of supervisory personnel to peacetime methods and processes. Many business practices condoned

IN RECOGNITION OF THE VALUE OF PLANNED TRAINING, THIS GROUP OF FOREMEN AT THE RCA VICTOR PLANT IN CAMDEN MEETS TO DISCUSS THE HUMAN FACTOR IN INDUSTRIAL PRODUCTION.



because of the war cannot be allowed to continue in a competitive market. The thinking of many supervisors on fundamentals of business economics and principles of scientific management has been altered by the demand for products being confined principally to one buyer, the Government, and by the wide existence of cost-plus contracts.

The struggle for business will also necessitate better training of sales staffs. Pre-war sales training methods too often devoted 90 per cent of their efforts to inspirational talks and only 10 per cent to instructing salesmen how to do their jobs more effectively. In stiff competition, this kind of "training" will not suffice. Because of the many scientific advances brought about by the war, much more attention will have to be given to technical features and applications of products, and to changes in markets and distribution occasioned by wartime shortages and substitutions. Smart business organizations are already giving "refresher" courses to their experienced sales managers and their staffs. In addition, they are cultivating recruits for their new sales groups, and short and long training programs are being developed *now* to be put into operation before and immediately after V-day.

Training programs are also being devised now by progressive business organizations to improve their relationships with distributors. Dealer improvement programs which will help increase the efficiency of the wholesaler and retailer are well beyond the drafting stage. As a matter of fact, some national organizations plan to spend several hundred thousand dollars annually in conducting special courses for their distributors. Some of the subjects are accounting, stockkeeping, store operations and effective merchandising — all of which are designed to make the distributor a more efficient business man. These companies believe that such efforts to increase the efficiency of their distributors will be reflected in increased sales and profits.

To absorb some of the excess American production of war-born and war-extended firms, foreign





IN THE HARRISON PLANT OF RCA VICTOR (ABOVE), JUNIOR ENGINEERS BROADEN THEIR KNOWLEDGE OF RADIO AND ELECTRONICS. CIRCLE—RECEIVING SPECIAL ON-THE-JOB TRAINING AT THE LANCASTER PLANT.

markets will be intensively cultivated. Companies engaged in export trade will need to develop special courses of training for young men to equip them effectively to sell and service products in foreign markets. Many special conditions surround the distribution of products in foreign countries. Sales representatives must therefore be thoroughly grounded in the applications of products to fit the particular needs of foreign buyers. Training will include an understanding of postwar problems, customs, buying habits, trade practices and the channels of distribution of each market. Universities will be called upon to design courses along these lines for sales representatives and many industries will enter into cooperative relationships with colleges for the training of prospective export sales representatives.

### *Learning Situations Planned*

Studies show that every executive, in fact, spends much of his time every day in instructing his assistants and in modifying their skills, habits, and attitudes. Many executives consider training as the principal tool of management. These men devote a portion of each day to the study of the strengths and weaknesses of their subordinates and to devising methods of developing them into better workers.

Some of the most effective training in industry is that carried on by capable supervisors who plan learning situations for their employees. Unfortunately, however, too few supervisors have been taught how to do this well. Some have failed to grasp the idea that training includes any instruction that is given an employee to help him do his work quickly, safely and efficiently. Much of the training in business has been by "absorption", a process so uncontrolled that employees often obtain misinformation, develop inefficient work habits and acquire wrong attitudes.

Planned training during the war has resulted in better use of manpower, greater speed in production, and practical use of inexperienced workers. The RCA organization fully recognizes the value of planned training as a means of developing the knowledge and skills of its employees—the human factor which is destined to play so large a part in postwar survival.

Manufacturing plants of the RCA organization at Camden and Harrison, New Jersey; Bloomington and Indianapolis, Indiana; Lancaster, Pennsylvania, and Hollywood, California, conduct a variety of training programs designed to fit the number of employees in-

volved, type of products being manufactured, volume of business, and other factors.

Orientation programs at RCA are conducted to assist new employees to get their bearings in the company. Through illustrated discussions and supplementary reading, new employees are acquainted with the background of the company, its policies, products and facilities. Each employee's interest, morale and efficiency is stimulated by these programs.

Pre-production training is given in vestibule schools to many new employees. Conducted near manufacturing sections, these classes are designed to teach new workers certain basic skills before assignment to the new job. This instruction increases the new worker's confidence in his ability to perform factory operations and shortens the time required to get him into production. Vestibule schools screen out persons who do not possess the interest and aptitude for factory work.

On-the-job-training, in which several hundred persons participate each month, is carried on in all RCA plants. The trainee learns to perform his job under the guidance of an experienced worker-instructor who has been taught effective ways of passing along the "know-how".

Training in related subjects is offered to RCA employees to supplement their instruction on the job. New employees in the machine shop, for example, work in the factory most of the day, but during part of the time they receive classroom instruction in subjects such as drill and punch press operation and blueprint reading.

Special product appreciation courses are conducted for employees during and after hours to familiarize them with the manufacture and application of products made by the company. One of the most popular courses is "How RCA Products Function." The average worker's contribution to a complete product is often very small and he is therefore unable to visualize how his efforts are integrated with those of others.

Work simplification is presented to operators and supervisors in short intensive courses to provide an understanding of the philosophy and principles of motion economy as related to their daily tasks. Many improvements in work methods, machines and equipment, resulting in the saving of thousands of dollars annually, can be traced to the training employees received through these courses.

### *Supervisors Are Trained*

Development of supervisory personnel constitutes an important part of RCA management. Conferences and special meetings are arranged to keep supervisors currently informed of changes in policies, methods and procedures. Better teamwork and coordination of effort are achieved across departmental lines through such conferences.

Recently a study of the average foreman's job in all of the plants was undertaken to provide a solid foundation for further training, and to gear the courses more nearly to fit the expressed desires and needs of this group.

Considerable emphasis has also been placed on having supervisors participate in the short intensive programs of the Training Within Industry Service of the War Manpower Commission. These special training programs are known as Job Instructor Training (how to instruct new workers), Job Methods Training (how to simplify work), and Job Relations Training (how to handle human relations problems).

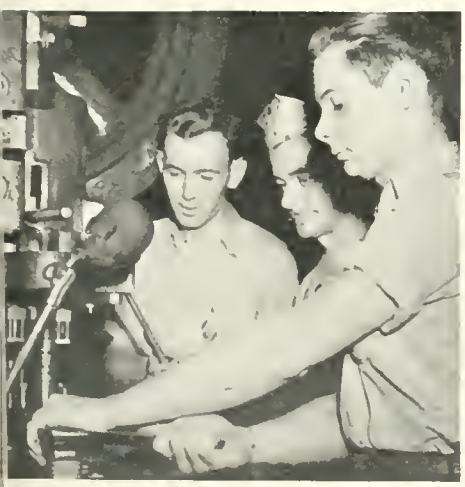
Job instructor training follow-through has been one of the most significant RCA plant-wide training projects. It was instituted to determine the results of Job Instructor Training and to coach supervisors and job instructors in the use of a simple, effective method of training new employees. This project has demonstrated what planned training can do to help supervisors increase production, improve quality and reduce costs.

After-hours classes are sponsored by the Company for ambitious employees who wish to prepare themselves for positions of greater responsibility. RCA benefits directly from employees' broadened knowledge of its managerial and technical problems growing out of such courses as production control, plastics, aviation, radio and television engineering. This program serves to discover talent and facilitate promotion of employees from within the Company.

A tuition loan and refund plan enables qualified employees to enroll in evening courses offered by various colleges. Tuition loans are repaid through payroll deductions. Participating employees are eligible for refunds at the end of the courses, the amount of refund depending upon the course grade earned.

This plan has enabled many deserving employees to complete their college courses or pursue necessary graduate work. The Company has benefited very much from this program, through the fresh outlook and point of view these employees bring to bear on the Company's problems.

Through these varied training programs, the human resources of the Company are being developed and strengthened. As the efficiency of employees is increased, a reduction in operating costs occurs which in turn permits a lower selling price and a wider market; employment is maintained or increased; employees experience more satisfaction on their jobs and human relations problems are simplified.

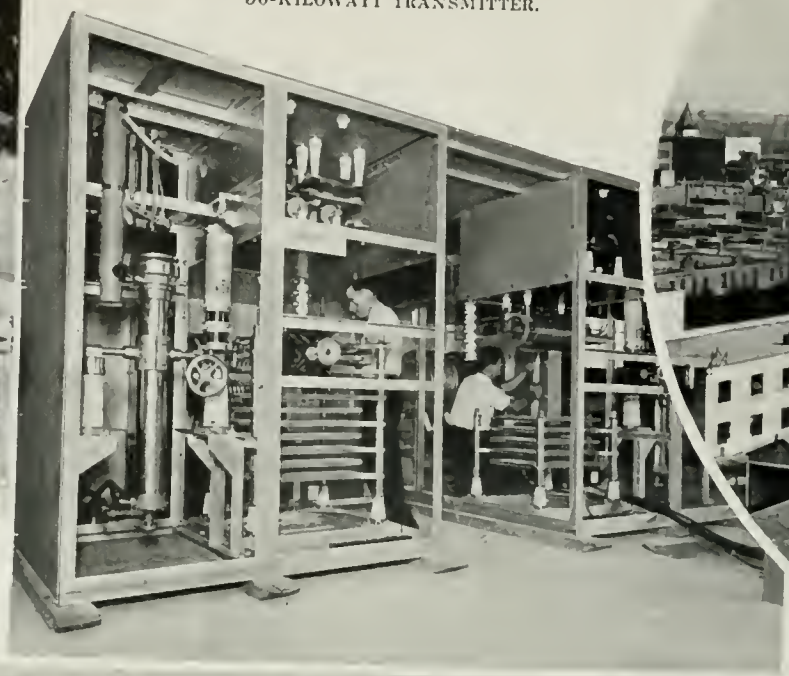


APPRENTICES IN TOOL AND DIE WORKS AT THE RCA VICTOR DIVISION PLANT AT INDIANAPOLIS ARE GIVEN INSTRUCTION IN MACHINE SET-UP.



TECHNICIANS WITH MANY YEARS OF EXPERIENCE GIVE DIVERSITY RECEIVERS THEIR FINAL ALIGNMENT.

UNDER CONSTRUCTION FOR CANADIAN BROADCASTING CORPORATION, THIS UNIT IS THE POWER AMPLIFIER OF A 50-KILOWATT TRANSMITTER.





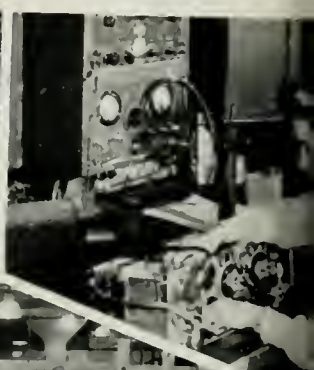
# RCA IN CANADA P



THIS LONG ASSEMBLY LINE PRODUCES THE HIGH FREQUENCY UNIT OF AIRCRAFT TRANSMITTERS.

A 5-KW. HIGH FREQUENCY COMMUNICATION TRANSMITTER NEARS COMPLETION.

RCA Victor Company has won high praise officials for its outstand developing, and man tions equipment for the of Canada, her sister n wealth, and other mem







THIS GROUP OF GROUND TRANSMITTERS IS READY FOR SHIPMENT TO THE ARMED FORCES.

CONTINUITY O
CONNECTIONS

AIRCRAFT TRANSMITTER-RECEIVER GOES INTO NEW TYPE REFRIGERATOR FOR OPERATING TESTS UNDER WIDE RANGE OF TEMPERATURES.





NAVY INSPECTOR CHECKS SPECIALLY CONSTRUCTED ENTERTAINMENT RECEIVER FOR SHIPBOARD USE.

# ODUCES FOR WAR

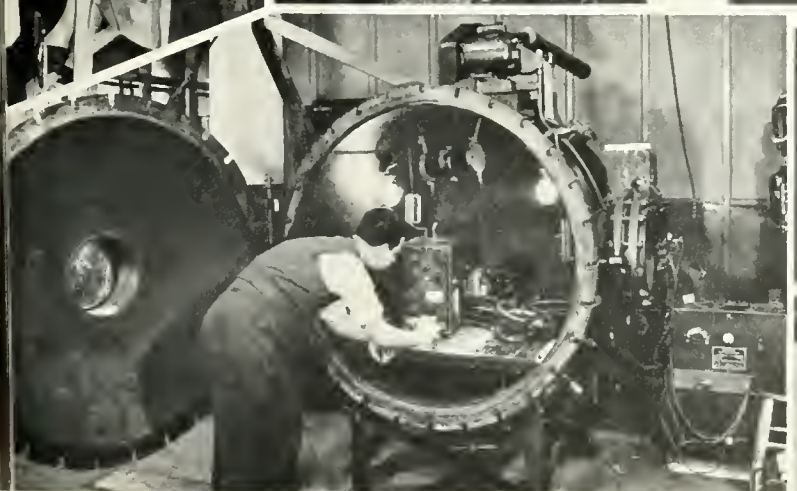
f Montreal, Canada, nadian Government ements in designing, radio communica- avy, and Air Forces he British Common- he United Nations.



THE TUNING UNIT IS ASSEMBLED ON ONE SIDE AND THE CHASSIS IS WIRED ON THE OTHER SIDE OF THIS PRODUCTION LINE FOR DIVERSITY RECEIVERS.



SEVENTEEN 250-WATT COMMUNICATION TRANSMITTERS READY FOR SHIPMENT TO THE UNITED NATIONS.



NDS OF ADIO SET

AIRCRAFT TRANSMITTER IN THIS CHAMBER IS TESTED UNDER CONDITIONS EQUIVALENT TO





CONFERRING ON THE ADMINISTRATION OF NBC FELLOWSHIPS TO GIVE MINISTERS RADIO TRAINING ARE, LEFT TO RIGHT, DR. TRUMAN DOUGLASS, THE REV. JAMES C. FLINT, THE REV. EVERETT C. PARKER, STERLING FISHER, DR. MAX JORDAN, AND DR. JAMES ROWLAND ANGELL

# NBC AWARDS 6 FELLOWSHIPS

***Network Inaugurates Plan to Bring Young Ministers More Actively Into Broadcasting—Closer Link Between Church and Radio Is Sought.***



By Dr. James Rowland Angell

*Public Service Counselor*
*National Broadcasting Company*

THE importance of radio for the churches of America has received rapidly increasing recognition in recent years, and certain seminaries have already set up training courses in this field for young men going into the ministry.

The general aim behind this movement is, obviously, to provide a closer link between the church and radio. The National Broadcasting Company, recognizing the need for bringing intelligent young members of the pastorate more actively into the field of radio, has concluded an agreement with the Congregational-Christian Churches which should go a long way in furthering this important trend. The plan calls for the setting up of two types of fellowships, to be awarded each year, starting in 1944.

In the first of these two categories, a joint committee from NBC and the Congregational-Christian Churches, have awarded fellowships to five ministers in the active pastorate. The fellows thus selected have been chosen from cities where the network has affiliates or managed and owned stations and will attend one of NBC's Summer Institutes in Chicago, Los Angeles, or San Francisco, where the work is carried on in cooperation with Northwestern University, the University of California, Los Angeles Branch, and Stanford University, respectively. The fellowship award in this case covers all tuition and incidental expenses involved in attending the Institutes.

A second type of fellowship will also be awarded each year, starting in 1944, to an outstanding seminary graduate. This fellowship carries a stipend of $1,000, and the winner will similarly attend one of the three Summer institutes and finish the rest of his fellowship year working on the staff of an NBC station. The fellowship this year was awarded through the Chicago Theological Seminary. Since the Seminary now conducts an extensive series of courses in radio for its students.

In the first category, the five ministers were selected from the Methodist, Presbyterian and Disciples of Christ denominations. They are: Dr. Bernard Montgomery, pastor of the Central Presbyterian Church in Portland, Ore., and chairman of the Radio Committee of the Portland Council of Churches; the Rev. Charles M. Crowe, pastor of the Centenary Methodist Church in St. Louis, Mo., conductor of a number of network radio programs and member of the radio committee of the Metropolitan Church Federation of St. Louis; the Rev. Edwin T. Randall, a Methodist, and conductor of the "Bible School of the Air," station KSTP, Minneapolis, Minn.; Robert S. Steele, a Methodist, of Hartford, Conn., and secretary to the radio committee of the Connecticut Council of Churches; and the Rev. Harley Patterson, pastor of the Richmond Avenue Disciples of Christ Church, and presently serving as chairman of the committee on radio and publicity for the Council of Churches of Buffalo and Erie County.

The winner of the seminary award is Frank Elliott, of the Chicago Theological Seminary, a Congregationalist, who has had several years of pastoral experience in Wisconsin.

All of the fellows have been selected solely upon the basis of their ability and promise in radio. Their religious denominational affiliation will not be a factor. This, I feel, is

perhaps the most important single contribution of the fellowship plan. While the project includes a financial agreement between the Congregational-Christian Churches and the National Broadcasting Company, there has been absolutely no stipulation placed by the church group on the religious connection of the ministers selected.

Much credit is due for the formulation of the plan to the Rev. Everett C. Parker, Acting Assistant to the Manager of the NBC Public Service Department, who collaborated with Dr. Max Jordan, director of religious broadcasts for NBC. The Reverend Mr. Parker is visiting NBC as Blatchford Fellow of the Chicago Theological Seminary and has had a great deal of experience in the field of religious radio. He was assistant chief of radio for the W.P.A. in 1936-1937 and has served as manager of WJBW, New Orleans, and production and program manager of WHIP in Hammond-Chicago. In addition, he has experimented widely through transcriptions with many different types of religious radio productions.

There appear to be grave deficiencies in the way today's religious broadcasting is conducted. Authoritative polls of radio listening habits in the United States show that religious programs rank at or near the bottom in listener interest among the various program types. On a national scale, even the best network religious programs are rarely able to attract more than 15 per cent of their potential audience.

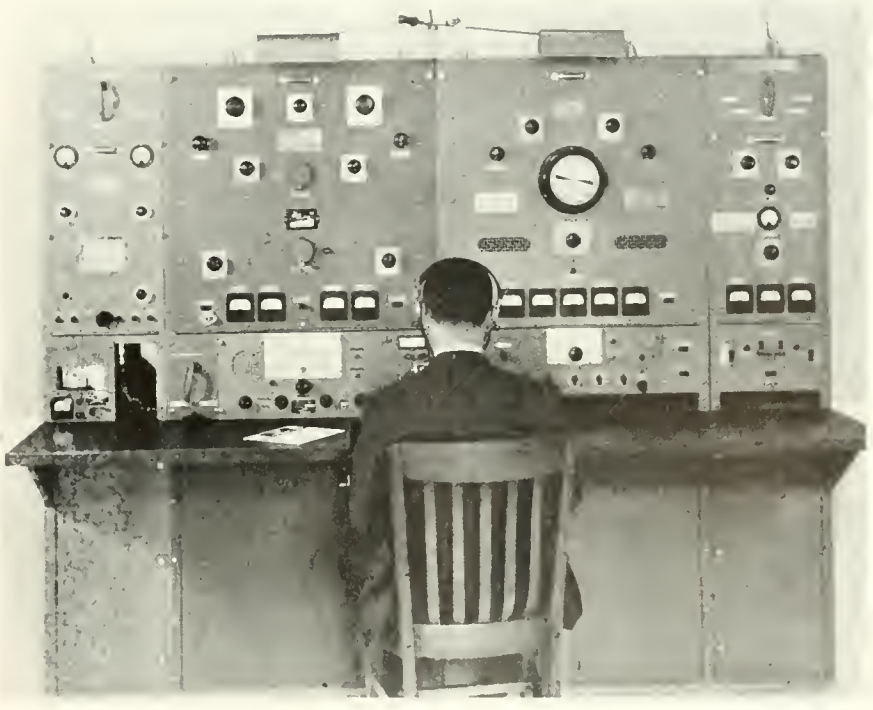
I need hardly explain that in many instances, religious programs fail to gain popular attention because of their program content. Many have argued that religious programs lack interest because they have not adopted the tried and successful techniques of radio, and also because large numbers of religious broadcasters are not trained in the writing, producing, and performing of radio programs.

Perhaps this is so. In any event, those of us involved in the present project are striving to give qualified members of the ministry an opportunity to study at first hand the intricacies of the broadcasting industry in the hope that they will then discover more effective means for presenting spiritual values and viewpoints over the air. Religious broadcasting should be able to compete on a professional level with the better commercial non-religious programs. But this is only possible if the church has at its disposal men who have trained themselves professionally for such a task.

We have established a committee to administer the fellowships. I am acting as chairman. Representing NBC on the committee will be Dr. Jordan and Sterling Fisher, Assistant Public Service Counselor and Director of the NBC Inter-American University of the Air. Representing the churches are: Dr. Truman Douglass, vice-president of the Board of the Home Missions of the Congregational-Christian Churches and member of the Congregational Christian Radio Committee; the Rev. Mr. Parker; and the Rev. James Flint, chairman of the Congregational - Christian Committee on Radio. In the award to the outstanding seminary graduate, Dr. Fred Eastman, professor of biography, literature and drama, of the Chicago Theological Seminary, represented the Seminary.

## New Marine Console

*Designed especially for the expanding Merchant Marine, including Victory ships and tankers, a "package" type marine radio console comprising three transmitters and three receivers has been developed and put into production by the Radiomarine Corporation of America. In addition to the transmitting and receiving units, which for the first time in console equipment provide for high-frequency operation over extremely long distances, the "package" includes an automatic radio alarm, an alarm signal keying device, a large operating table with built-in typewriter well, and facilities for charging all storage batteries associated with the equipment.*



IN THIS MARINE RADIO CONSOLE DEVELOPED BY RADIOMARINE CORPORATION OF AMERICA, THE TRANSMITTERS CAN BE PUT ON THE AIR WITHIN FIVE SECONDS





A PORTABLE TELEVISION CAMERA EQUIPPED WITH THE HIGHLY-SENSITIVE ORTHICON TUBE PICKS UP CIRCUS SCENES IN MADISON SQUARE GARDEN. CIRCLE—PACKED IN EASILY-CARRIED "SUITCASES", CONTROL AND TRANSMITTING UNITS OF PORTABLE FIELD EQUIPMENT ARE SET UP IN A ROOM ADJACENT TO THE GARDEN ARENA.

# Television Goes Afield

*PORTABLE CAMERA-TRANSMITTERS DEVELOPED BY RCA VICTOR ARE EXPECTED TO ACCELERATE PROGRESS OF NEW SERVICE.*

By Henry E. Rhea

*Engineering Products Department*
*RCA Victor Division*

RCA engineers may be proud that despite the obstacles—technical, economic, and others—that have confronted them, their faith in the future of television has never wavered, and that, partly for that very reason, the contributions of RCA scientists and engineers far surpass the accomplishments of all others combined.

The list is a familiar one and need not be repeated in detail. It includes the Iconoscope, the Orthicon, the Kinescope, the first all-electronic television system, the first high power television transmitter (40 kilowatts — built in 1936), the first electronic projection picture, the first commercial television station, and the first relay system.

Hundreds of man-years of work, as well as millions of dollars, have gone into the television work conducted by our Laboratories. The accumulated results of this effort and unswerving faith of our organization in the future of television are the seeds from which a great new industry will grow.

There are numerous signs that the seed is beginning to sprout. In the radio magazines, the trade publications, and the daily press, television is an important topic. Broadcasters, film companies, newspapers, educators, department stores, advertising agencies — all are looking with interest at this fledgling industry.

Most significant of all is the list of television station licenses and applications for licenses now on file with the Federal Communications Commission. As of May 1, 1944, the number totaled fifty-five. Some thirty cities are represented in this list, including New York, Philadelphia, Boston, Rochester, Baltimore, Washington, Pittsburgh, Richmond, Chicago, Los Angeles, Hartford, Denver, Oklahoma City, Minneapolis, Albuquerque, New Orleans, Cincinnati, San Francisco, Cleveland, Milwaukee, Hartford, and Spokane.

This represents an immediate post-war market for our transmitting and receiving equipments. But before this market will develop, an important question must be answered. Where will good programs be obtained? Col. David Sarnoff, in a paper published over seven years ago, stated:

"Whoever the sponsor may be, or whatever his interests or purposes, he will be under the compulsion to provide programs that will bring pleasure, enlightenment and service to the American public. That compulsion operates today and must continue to operate if we are to retain the American system of radio broadcasting."

His statement assumes new significance today.

As a partial solution, the American Telephone & Telegraph Co. recently announced their plans for establishing a television network connecting all of the more important metropolitan areas of the country. This network will extend from Boston to Miami, Atlanta to Los Angeles, from San Francisco to Chicago to New York, and it is expected that it may be completed by 1950. NBC, which is the pioneer in television station operating and programming, and which is today originating programs for rebroadcast in the Philadelphia and Albany-Schenectady areas, is planning to assume the same role of leadership in television network programming that it now holds in the field of sound broadcasting.

In another approach, some of the film companies are engaged in ex-

tensive study and planning for the filming of special programs for distribution to television stations.

Networks and films alone, however, will probably not be sufficient. Live talent shows of local origin will be desirable if the station is to render proper service to its public. This could impose an economic burden inasmuch as many of the stations will be relatively inexperienced in the technique of television programming and consequently will require considerable rehearsal before obtaining a studio show good enough to put on the air.

There are several ways that this job can be lightened. One way is the extensive use of remote pick-ups, which are comparatively inexpensive and need little or no rehearsal, until such time as the station is in a position to stage the more elaborate inside studio shows.

Another way to provide good programs without undue cost is by film, the electrical transcription of television. On this basis, many of the stations may start out using field pick-up and film equipment for the majority of their programs. Studio cameras and associated apparatus could then be used for developing studio program techniques, and building special shows, until such time as sufficient experience has been obtained to permit extending the scope of programming operations.

Film equipment for television use was developed by our engineers many years ago. A special projector is necessary in order to provide the "transformation" from the twenty-four pictures per second which is standard speed for 35 millimeter movie film and the thirty pictures per second standard speed employed in modern television systems. The only other important requirement of television film apparatus is that it reproduce faithfully. This is accomplished by careful design of wide band amplifiers, deflection circuits, and other system components.

### *Wide Range of Uses*

Field pick-up equipment, however, must comply with a wide range of specifications. This becomes obvious from an inspection of its uses—outdoor and indoor sporting events, spot news pick-ups, on-the-street interviews, important public events, circuses, concerts, as well as telecasts from within the main studio.

This imposes the need for designing the field equipment to be small, light in weight, yet rugged and durable to withstand rough handling; it must be easy to operate and maintain, capable of being put into operation in the shortest possible time, and must operate satisfactorily under a wide variety of climatic conditions. High definition and good stability during operation are essential. Above all, it must have maximum sensitivity to permit use under conditions of low light.

The need for such equipment was recognized early, and in 1937 the first step was taken to develop and design, for commercial use, a compact transportable television system. The result was the much-famed Type 510A Demonstration Unit which was extensively used at fairs, exhibitions, and demonstrations throughout the country, and also was employed to some extent in a few television stations.

The unit consisted of a control cabinet which was about the size of a 12-inch television receiver and included all of the video control circuits and a monitor. Also provided was an iconoscope-type camera. This demonstration apparatus was not entirely self-sufficient from the standpoint of producing standard television signals and was also fairly large and heavy. It was recognized that in order to provide an equipment that would be suitable for field use, it would be necessary to break the system down into smaller units which could easily be carried.

In 1939, we first started the development and design of such equipment. The cameras were much smaller than any that had ever been previously constructed and used a small version of the iconoscope pick-up tube. The other units comprising the equipment consisted of a master pulse generator, a pulse shaping unit, camera control, master control, and power supplies. Each of the units, with the exception of the cameras, was constructed in suitcase style and was light enough to be easily carried by one man. Equipment of this type was constructed for the National Broad-



RCA PORTABLE TELEVISION EQUIPMENT (LEFT) IS SO LIGHT THAT A ONE-CAMERA UNIT CAN BE EASILY CARRIED IN AN ORDINARY PASSENGER AUTOMOBILE. BELOW—THE FIRST TELEVISION EQUIPMENT DESIGNED FOR OUTDOOR REMOTE PICK-UPS WAS INSTALLED IN TWO LARGE MOTOR VANS.



casting Company and the Don Lee Organization in California. It was put into service in the latter part of 1939.

After sufficient field experience had been obtained, certain limitations were found. In particular, in televising football games, which are an extremely popular source of programs, it was discovered that when the late afternoon shadows fell on the field, the sensitivity of the cameras was not sufficient to produce a good quality picture. The next step in the program, therefore, was to adapt the newly developed orthicon to a field camera. . . . This tube is approximately ten times as sensitive as the iconoscope and greatly extended the scope of field operations.

### *Requires Small Staff*

In 1940 and 1941, orthicon type field equipment was developed and constructed for such organizations as the Bell Telephone Laboratories, Columbia Broadcasting System, National Broadcasting Company, and Don Lee. It proved to be very satisfactory and enjoyed a variety of uses. For example, all of the pick-ups from Madison Square Garden are made with this type of apparatus. It is easily set up and is so designed as to permit operation by a small staff of technicians.

In actual use, the camera control and master control units are grouped with the synchronizing generator at some central control location. It is possible at this location to preview the picture from each of the cameras before switching to the relay transmitter through the master control unit. The cameras are, of course, located on the field of action and can be spaced as much as 500 feet from the central control location.

The relay transmitter and receiver supplied with this apparatus were designed for operation in the 300 megacycle band. They employ directive antenna systems and satisfactory line of sight transmission over ranges up to ten miles has been obtained.

In the cameras, provision was incorporated for using a variety of lens types. During an actual pick-up, it is usual practice to provide one of the cameras with a long focal length lens to permit close-ups while the other camera is used with a short, or medium, focal length lens in order to cover a wide portion of the field of action. Panning and tilting heads, of course, are standard equipment. View finders are provided in the cameras so that the cameramen not only can follow the action in the field but also can perform optical focusing.

The camera control units contain the deflection generators and amplifiers for the cameras and the wide band high fidelity video amplifier. A 7-inch monitor is included in each camera control unit as is also a 3-inch oscilloscope to permit accurate adjustment of the signal level.

Signals from the various camera control units are connected to the input of the master control. In this unit, synchronizing signal is mixed with video signal and switches are provided for switching the output of any one of the cameras to the outgoing cable. The 7-inch monitor is connected to the outgoing cable and a 5-inch oscilloscope is incorporated to maintain signal level adjustments. The outgoing cable, of course, feeds the relay transmitter.

The synchronizing generator consists of two units—one being the master pulse generator, and the other containing the shaping circuits where the synchronizing pulses, blanking pulses, and deflection pulses are formed.

The receiver, like the rest of the apparatus, has wide band amplifiers so that no loss of definition results. AVC circuits are provided to minimize the effects of signal fluctuation. Generally, the receiver is located in either the main studio or the main station transmitter room. A photograph of this prewar apparatus is shown.

### *Improvements Planned*

When we are again in a position to start the manufacture of television station equipment, there are a number of additional improvements that may be incorporated.

For example, it may be possible to build our new equipment around a more sensitive pick-up tube. It would be possible with this equipment to televise nearly any scene that can be clearly observed by the human eye.

It is likely that the relay transmitter and receiver will operate on higher frequencies and consequently, for the same range of satisfactory transmission, will be considerably smaller and lighter in weight. This will be made possible through the use of extremely directional antenna systems.

It is also expected that the design of the apparatus will be of such form as to permit a more rapid set-up on the field of action. A station wagon or truck can be utilized and the interior arranged so that the control units can be mounted on an operating desk and remain in place during those pick-ups where it is possible to drive the station wagon or truck near to the scene to be televised. This would make necessary the removal of only the cameras from the truck and will materially reduce the set-up time. Provisions could be made for the easy removal of the control and other units so that, when it is not possible to get the truck close to the scene of action, the entire set could be removed in a very short time and placed in operation on the field.

### *Better Programs Possible*

With this type of equipment, the scope of field pick-ups will be greatly extended. Events that previously could not be televised because of equipment limitations, such as low sensitivity, could then be successfully utilized. It would, for example, be possible to use the apparatus in a department store for demonstrating products via television to the public or to customers in other parts of the store. This could be done without resorting to the expensive and powerful lights that are now required for adequate illumination.

Basketball games, hockey, and prize fights could be satisfactorily televised without supplementing the existing lighting systems. Night baseball and football could be used successfully for the first time as television program material. Many other new sources of material would be uncovered.

Such equipment will do much to accelerate the progress of television. It will make possible far better programs at lower costs, and thus will encourage public acceptance of the new service.

# "ARTHUR HOPKINS PRESENTS"

*NBC Creates New Form of Radio Dramatic Expression in Program Series Under Supervision of Dean of American Theater Producers.*

WITH the inauguration of its new dramatic series "Arthur Hopkins Presents", the National Broadcasting Company has added one more page of progress in radio presentation of drama. The new programs, presenting full hour radio versions of great stage plays, with as nearly as possible the original stars, have already in a few short weeks achieved recognition from the public and the press alike.

In planning the series, Clarence L. Menser, NBC Vice-President in Charge of Programs, invited Arthur Hopkins to produce the plays for NBC. It was Menser's feeling that with Hopkins' vast theatre background as the dean of American theatre producers and with the resources of NBC, a new radio dramatic expression could be created. It was Menser's idea to present "theatre radio," not just radio or just theatre.

Hopkins, Menser and Wynn Wright, NBC National Production Director, and director of the series, have made the program different in the sense that it does not seek to use radio effects for their own sake, but employ them only to aid the drama. The play is the thing always. Music, sound effects and other particular radio creations are integrated into the whole performance so that they do their job, without being separate entities as entertainment.

Not only in its general purpose or the distinguished personnel is this series so significant, but also because of the calibre of the stars and the plays. So far such distinguished artists as Frank Craven, Dorothy Gish, Louis Calhern, Philip Merivale, Katharine Hepburn, Pauline Lord, J. Edward Bromberg, Dudley Digges and Montgomery Clift have appeared on the show, with many more outstanding names to come.

### *Hopkins Explains Action*

In announcing his decision to produce on the air after more than thirty distinguished years in the theatre, Hopkins said:



ARTHUR HOPKINS, DEAN OF AMERICAN THEATER PRODUCERS

"One of the regrettable extravagances of the modern theatre is the shelving of plays once they have been removed from regular presentation. There are many plays of abiding interest that too soon become neglected treasures. Many people would like to hear them again, and an infinitely greater number who have never heard them should not be denied the opportunity. Frequently hastily abbreviated versions of some of these plays have been heard on the radio.

"For the first time, there is now to be a comprehensive program of outstanding plays in full hour performances, carefully prepared so that the original emotional impact and character significance are fully conveyed.

"Wherever possible, actors and actresses originally identified with the plays will be obtained. It is not the plan to discard these plays once they have been presented, but to build up a permanent repertoire to be drawn upon in the future.

"Thus, through the National Broadcasting Company, there is an opportunity simultaneously to create a people's theatre and a repertory theatre, two dreams that have long seemed impossible of fulfillment."

The broadcasts are heard Wednesdays at 11:30 p.m. (EWT).

KATHARINE HEPBURN (BELOW) IS AMONG THE DISTINGUISHED ARTISTS PARTICIPATING IN THE "ARTHUR HOPKINS PRESENTS" SERIES. SHOWN WITH HER ARE WYNN WRIGHT (LEFT), NBC NATIONAL PRODUCTION DIRECTOR, AND CLARENCE L. MENSER, NBC VICE PRESIDENT IN CHARGE OF PROGRAMS.



# NBC IN TEACHING PROJECT

*Network, In Cooperation with Columbia University, to Offer Comprehensive Series of Courses in Sound and Television Broadcasting Starting Next Eall.*

ANOTHER forward step in the field of education has been taken by the National Broadcasting Company with the announcement that starting next Fall the network, in cooperation with University Extension of Columbia University, will offer a comprehensive series of courses in sound and television broadcasting. The joint announcement, made by Dr. Nicholas Murray Butler, president of Columbia University, and Niles Trammell, president of NBC, described the courses as the most comprehensive series ever presented by an institution of higher learning in collaboration with a radio network.

This action follows logically on the heels of the recent agreement between NBC and the New York City Board of Education to present a series of courses aimed at training teachers in the use of radio as a classroom supplement; and at creating an experimental center for training talented high school seniors in radio fundamentals. How neatly these two projects dovetail is seen in the inclusion of the Columbia courses by the Board of Education for teacher credit toward salary increments in its in-service teacher training program.

### *NBC Supplies 10 Teachers*

According to the Columbia plans, twenty-two courses are included in the newly-constituted radio unit and in related fields of study under University Extension. Of these, thirteen are specifically in the new sound and television broadcasting project, and nine are offered in the divisions of physics, electrical engineering and sociology. Eleven of the thirteen courses in the radio unit will be given next September.

The courses will be under the direct supervision of Dr. Russell Potter, director of the Institute of Arts and Sciences at Columbia, and Sterling Fisher, NBC Assistant Public Service Counselor and director of the NBC Inter-American University of the Air. Class meetings will be held at Columbia University and in studios at the network's Radio City headquarters. Ten of the initial eleven courses will be staffed by teachers selected from NBC's operating personnel.

As in other units of University Extension, prospective students will be required to satisfy the instructors on their qualifications for admission, and the courses may be counted for credit toward one of the University's degrees with the approval of the appropriate dean or director.

### *Butler Welcomes Opportunity*

In announcing the new courses, President Butler declared:

"It is significant that in the arts and techniques of radio, a new channel of communication has been established of no less consequence in its social and educational implications than the invention of the process of printing from movable type. Columbia University welcomes this opportunity of cooperating with a great national network in developing trained leaders in radio."

President Trammell said in the joint announcement:

"By all standards this is one of the most far reaching developments of studies in the field of sound and television broadcasting ever undertaken at an institution of higher learning. The National Broadcasting Company welcomes the opportunity to cooperate with one of the nation's oldest and most distinguished universities in throwing more widely open the doors of education in radio to qualified students and teachers. While this new radio unit is, perhaps, the most comprehensive of its type yet developed, we confidently expect that the courses of studies will be broadened in the future to include many other phases of radio and television broadcasting, professional and technical.

"This project, along with the plan of studies recently announced by NBC in connection with the New York City Board of Education, immensely widens the area for training talented students and teachers in fields hitherto little explored by them."

### *Workshop on Campus*

In several respects, this new radio unit resembles the work currently done at Chicago, Los Angeles and San Francisco through the NBC Summer Institutes at Northwestern, U.C.L.A. and Stanford Universities. However, it is pointed out that the Columbia project involves the regular session of Columbia rather than the Summer Session.

The Columbia University Radio Club, a low-powered station with a radiation confined to the Columbia University campus, will be used as a workshop for the radio students in several of the courses. Classes may also use the facilities of WEAF-FM, the network's outlet in the New York area.

The following courses, designed under the supervision of Harry M. Ayres, acting director of University Extension, and Dr. James Rowland Angell, NBC Public Service Counselor, will be offered during the 1944-1945 university session:

*Introduction to Radio Writing.* Three points each session. Instructor is Morton Wishengrad, staff writer, NBC Inter-American University of the Air, and author of "Lands of the Free." Course will give a detailed examination of current theories, techniques and markets in radio writing.

*Advanced Radio Writing.* Three points each session. Instructor is Wade Arnold, assistant manager of the NBC Script Division. Course is an advanced workshop for those actively interested in professional radio writing as a career.

*Radio Publicity and Promotion.* Two points, Spring session. Instructor is John McKay, Manager of NBC Press Department. Course offers practical picture of the relationships among publicity department and station, sponsor, program producer and advertising agency.

*Speech for Radio.* Two points, Winter session. Instructor is Professor Jane Dorsey Zimmerman, Associate in Speech at Teachers College. Course in voice and diction for those who wish to prepare for speaking, reading and acting in radio.

*Radio Announcing.* Two points, Winter session. Given at NBC. Instructor is Patrick J. Kelly, head of the NBC announcing staff. Course deals with the fundamentals of commercial and sustaining copy for radio, with extensive laboratory work.

*Uses of Broadcast and Television Equipment.* Two points, Winter session. Given at NBC. Instructor is Ferdinand A. Wankel, NBC Eastern Division Engineer. Lectures and demonstrations explain the use of microphones, transcription turntables and studio control booth equipment.

*Sound Effects.* Two points, Spring session. Given at NBC. Instructor is Dr. Frederick G. Knopfke, manager of the NBC Sound Effects Division. Course designed to familiarize students with the purpose and use of sound effects, and problems connected with the work of the sound effects technician.

*Production of Radio Drama.* Three points each session. Instructor is Frank Papp, NBC Production Director of "American Story," "Here's to Youth" and others. A laboratory course in the performance and direction of radio plays.

*Advanced Production of Radio Drama.* Three points each session. Given at NBC, instructor to be announced. A practical workshop for students who have had previous experience and training in radio acting and producing.

*Television Production Problems.* Two points, Winter session. Given at NBC. John F. Royal, NBC Vice President in Charge of International Relations, Television and Shortwave. Lectures and demonstrations will familiarize students with production of television programs in the studio, in the field and from films.

*Music for Radio.* Three points, Winter session. Given at NBC. Series of 15 lectures by members of the NBC Music Division and others. Lecturers include Samuel Chotzinoff, Manager, NBC Music Division; Ernest La Prade, Director of Program Preparation; Thomas H. Belviso, Manager, Music Library; Dr. Frank Black, General Music Director; Morris M. Mamorsky, composer and conductor; Gilbert Chase, of the Inter-American University of the Air; David Hall, Script Division; Arthur Austin, producer of "Music of the New World," and Thomas A. Bennett, Assistant Production Manager in charge of Popular and Variety Shows. Course deals with planning, personnel, talent, conducting, composing, production, writing, musicology and clearance and copyright.

Plans for the future call for additional courses in the fields of script writing and broadcasting for radio and television news services; programming, sales, and classroom utilization.

## RCA Workers Donate Blood

War workers in six plants of the RCA Victor Division of Radio Corporation of America have thus far contributed 9,942 pints of blood to the Red Cross since inception of drives conducted on the factories' premises during hours of employment.



DR. FRANK BLACK

## MUSIC CRITICS CIRCLE IN SYMPHONY AWARD

### *"Jeremiah" Wins First Prize In Chamber Music Competition Presented on NBC Program*

COOPERATING with the Music Critics Circle of New York, the National Broadcasting Company—for the second year in a row—provided facilities for the group's annual quest for the outstanding symphonic work introduced in public concert. Also, NBC extended studio and musical assistance which helped make possible the circle's first competition for new chamber music compositions.

The symphonic competition was presented over the network Thursday, May 11, as a special presentation of the NBC Inter-American University of the Air, with Frank Black conducting the NBC Symphony Orchestra in the three works nominated for the selection of "best." The works heard included: Leonard Bernstein's "Symphony No. 1" ("Jeremiah"), William Schuman's "Symphony No. 5 for Strings" and Norman Dello Joio's "Magnificat." At a subsequent meeting, the scroll award went to the Bernstein work.

Nan Merriman, NBC mezzo-soprano, was the vocal soloist in the broadcast "rehearing" of the "Jeremiah" symphony which won the prize.

Following the Critics Circle symphonic broadcast in Radio City's Studio 8-H, the NBC Press Department was host to the members of the circle—music reviewers of metropolitan newspapers and several magazines—at a supper party.

Because of limited air time—and the long list of nominated compositions—just one of the candidate selections in the Critics Circle chamber music competition was presented over NBC on May 21. Two string quartets—formed from the ranks of the NBC Symphony—performed the nominated works heard in the Radio City studio.

The broadcast work—Randall Thompson's "Quartet No. 1 in D Minor"—was played by Mischa Mischakoff, first violin; Daniel Guilet, second violin; Carlton Cooley, viola and Benar Heifetz, cello. Non-broadcast compositions heard by the critics in the same studio included "String Quartet in E Minor" by Leroy Robertson—rendered by Joseph Gingold, first violin; Bernard Robbins, second violin; Milton Katims, viola, and Harvey Shapiro, cello—and "Sonata for Piano and Violin" by Aaron Copland. The latter work was presented with Lukas Foss at the keyboard and Mischa Mischakoff handling the bow. Sergeant Andrew Imbrie's "String Quartet," which was "re-heard" by the critics earlier in the day at Station WQXR's studio, performed by the Bennington Quartet, won the year's chamber music award.

A condition of the Critics Circle symphony and chamber music contests was that each nominated work had to be by an American composer and introduced in public concerts during the season just ended. Compositions which had air premieres only were not eligible for awards. However, the radio-introduced works are permitted to be entered in the competition in subsequent seasons when they have New York concert hall renditions.

A vote of thanks was given by the Critics Circle to NBC and the cooperating musicians.



MAJ. GEN. HARRY C. INGLES, CHIEF SIGNAL OFFICER, U. S. ARMY, PRESENTS THE SIGNAL CORPS' "CERTIFICATE OF APPRECIATION" TO WILLIAM A. WINTERBOTTOM (CENTER), VICE PRESIDENT AND GENERAL MANAGER, R. C. A. COMMUNICATIONS, INC., IN THE PRESENCE OF LIEUT. GEN. JAMES G. HARBORD, CHAIRMAN OF THE RCA BOARD OF DIRECTORS.

# SIGNAL CORPS HONORS RCAC

*Certificate of Appreciation for Outstanding Assistance to Armed Forces Rendered by Company Presented to Winterbottom by Major General Ingles.*

DECLARING that it would be impossible to pay for the assistance that has been rendered to the armed forces by R.C.A. Communications, Inc., a service of the Radio Corporation of America, Maj. Gen. Harry C. Ingles, Chief Signal Officer of the United States Army, on June 23 presented to RCAC one of the first Certificate of Appreciation awards of the Signal Corps, as "concrete" evidence of how much the Army appreciates what has been done.

The presentation was made to William A. Winterbottom, Vice President and General Manager of RCAC, at the company's offices, 66 Broad Street, in a brief ceremony attended by Lieut. Gen. James G. Harbord, Chairman of the Board of RCA, and other officials, together with Col. Jay D. B. Lattin and Maj. Wilbur H. Moody, of the 2d Service Command.

"The matter of finding a way of expressing our appreciation to RCA for the immense benefit it has been to all of the Army during this year is something we have been studying over," General Ingles said "for it is a service and we have a contract for it, and there is the usual money transaction, which does not cover the transaction at all. You can't pay for the service which RCAC has been rendering to the armed forces. Not only has RCAC given freely of facilities but also of personnel."

In replying to the presentation, Mr. Winterbottom said that relationship between the Army Signal Corps and RCAC has always been cordial, cooperative and helpful, because "we are all good communication men, speaking the same language and thoroughly understanding the extreme importance of speedy and accurate communications."

Mr. Winterbottom expressed regret that the President of RCA, Col. David Sarnoff, was unable to attend the ceremony, but remarked that he was certain the duty to which he had been assigned by the Signal Corps in Europe was much more important. Colonel Sarnoff is special consultant to the Communications Branch, Public Relations Office, Supreme Headquarters of the Allied Expeditionary Force.

In conclusion, Mr. Winterbottom told General Ingles that "the Army Signal Service can always depend upon the men and women of RCA."

## Award to Beverage

DR. HAROLD H. BEVERAGE, Associate Director of RCA Laboratories in Charge of Communications Research, on June 28 was presented the United States Army Signal Corps' coveted Certificate of Appreciation in his office at R.C.A. Communications, Inc.

The presentation was made by Colonel Jay D. B. Lattin, Signal Officer of the Second Service Command, representing Major General H. C. Ingles, Chief Signal Officer of the U. S. Army Signal Forces.

As stated in a letter of citation received by Dr. Beverage from Major General Ingles, the award was in recognition of Dr. Beverage's "tireless effort and valuable advice during the installation of a radio circuit in the North Atlantic route" which "constituted a great contribution to the Signal Corps in its gigantic task of furnishing the United States Army the world's greatest communication system."



DR. H. H. BEVERAGE RECEIVES "CERTIFICATE OF APPRECIATION" FROM COL. JAY D. B. LATTIN.

## WINTERBOTTOM MARKS 30th YEAR WITH RCA

*Toss of Coin in 1903 Led Vice President, General Manager of RCAC Into Radio.*

A FATEFUL toss of a coin resulted in William A. Winterbottom's leaving his native Liverpool to come to New York in 1903 as a cable operator and later joining the Marconi Wireless Telegraph Company as a stepping stone to his present position as the Vice President, General Manager and a Director of R.C.A. Communications, Inc.

Mr. Winterbottom, who today administers 52 international radio circuits for the public and other services for the Government, was presented a 30-Year Diamond Service Emblem on June 1, 1944, 30 years to the day after he sat down at his desk in the Woolworth Building as Commercial Manager of the Marconi Company. Presentation of the emblem was made by a fellow director, Colonel Manton Davis on behalf of RCAC employees.

Mr. Winterbottom first heard the call of wireless in 1902 while he was a junior operator in the British Post Office at Manchester. He took a half day off and went to the first commercial radio installation—a ship-to-shore station in the north of England. After proving his ability to hold down an operator's job, he declined an offer to go to work, although he had great faith in wireless, and instead sought out the local cable companies' offices in Liverpool. He stood in the doorway between two windows; one read "Western Union" and the other "Commercial Cables". He tossed a coin. Commercial Cables won.

This company sent him to New York and the following eleven years he worked successfully as cable operator, Branch Manager, Solicitor and Director of Traffic Production. Meanwhile he followed the development of wireless. He built and operated his own station before the days of Government licenses. Deciding that the future of communications was in the newer art of wireless, he quit the North Atlantic cable service and went to work on June 1, 1911 for Edward J. Nally, then Marconi Company's General Manager, who five years later became RCA's first president. Contract Manager for the Marconi Company at that time was Colonel David Sarnoff, RCA president now on active duty overseas.

In 1919, Mr. Winterbottom was appointed Traffic Manager, and when the newly formed RCA took over the Marconi Company properties, he continued in the same office. RCAC was organized as a communication subsidiary in 1929 and he was elected Vice President in charge of communications. He has been Vice President and General Manager since 1930 and a Director since 1932. He has travelled widely in the negotiation of traffic agreements.

Born on May 31, 1884 at Liverpool, England, Mr. Winterbottom became interested in electricity as a boy and was only 16 when he entered telegraphy.

Today he lives at Bayside, L. I. His hobbies are woodworking, growing rare orchids, photography and, until the war, sailing his 48-foot cruiser the "Randa."

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# CONVENTION FILMS TELEVISED

*NBC Station WNBT Begins Historic Coverage of Chicago Political Meetings with Week-Long Presentation of Motion Pictures of Republican Sessions.*

WNBT, National Broadcasting Company's television station in New York on the night of June 26 began its historic video coverage of the Chicago political conventions. The coverage continued all week until the gavel fell announcing the adjournment of the Republican meeting; it will pick up again with the Democratic meeting in the same city.

Preceding the telecasting of special motion pictures which were shot by four crews in the Chicago Stadium on opening day was the premiere of "The Republican Party on Parade." This reel traced the history of the Republican Party, its conventions and its candidates from 1860 to the present. It began with sketches by Thomas Nast, dean of American political cartoonists, who created the elephant as the symbol of Republicanism.

Following a quick sight-seeing "tour" through Chicago, the picture moved on to the personalities of the G.O.P. The Republican conventions of 1932, 1936 and 1940 were traced.

The shots taken on June 26 and televised on arrival in New York included the call to order of the convention, the singing of the "Star Spangled Banner," the invocation, Governor Dwight H. Green's welcoming address, close-ups of practically all State delegations, the press section of 400 news men and women, and all the color which surrounds these meetings.

WNBT, located on the Empire State tower in New York, acted as the basic transmitter feeding WPTZ, Philadelphia, by a radio relay link in South Jersey, and WRGB, Schenectady, which also serves Albany, by direct signal into that transmitter, 129 miles away.

In the Chicago Stadium, a battery of film cameras ground away alongside numerous news reel crews, recording the many-faceted scenes for the television audiences in the four eastern cities. Supplying these large and important areas with this visual service would be considered a progressive step in itself, but with Gov. Dewey of New York an outstanding presidential possibility, NBC's pioneering move becomes of far greater importance.

Express planes shuttled the exposed reels of convention films from the Chicago airport to La-Guardia Field in New York.

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Buy War Bonds

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# 50,000 PRODUCTION IDEAS

*RCA Victor and Radiomarine Employees Strike Heavy Blow at Nation's Enemies Through the Adoption of 35% of Suggestions for Improvements.*

RCA employees, using their natural ability and ingenuity to figure out ways to do their jobs better and easier, and save valuable production time and materials, are setting a high standard of "thinking for Victory" for the war plants throughout the nation.

More than 50,000 production ideas—averaging at least one for each member of the RCA family composed of 41,000 men and women—have been dropped into suggestion boxes since Pearl Harbor was smashed in the sneak Japanese attack on December 7, 1941.

### *High National Ranking*

That these suggestions dropped into the special boxes provided at the various plants have had an effect as deadly as bombs dropped upon the Axis by Allied war planes is indicated by the fact that a single RCA plant—RCA Victor Division at Harrison, New Jersey—stands fourth among more than 4,000 war plants and shipyards in the entire country in point of total national honors conferred by the War Production Board to labor-management committees sponsoring suggestion systems.

Keyed up by the long-heralded invasion, labor-management committees at Harrison and Camden launched special pre-invasion suggestion drives in May, while a month earlier President Charles J. Pannill announced the Radiomarine Corporation of America Suggestion Plan, which in its first two weeks stimulated 568 suggestions, of which eighty-two were granted prizes.

D-Day, which electrified the world on June 6, was an appropriate occasion for announcement of results of the 15-day pre-invasion suggestion drive staged under labor-management committee auspices, May 16-31, at RCA Victor Division, Camden. In this fruitful "Suggest for Victory Campaign," 3,255 suggestions were jammed into the suggestion boxes, representing an average of 200 a day to add to Axis woes.

Donald M. Nelson, Chairman of the War Production Board, told Harrison workers that their production ideas "have helped make invasion possible," in a telegram recently received by Chairman Joseph N. Mayer and Vice Chairman W. L. Van Keuren of the plant's War Production Drive Committee, representing employees and management respectively.

Aptly titled "Suggestion Armada", Harrison's pre-invasion drive commenced May 29 and closed June 10. By the time General Eisenhower's record invasion armada got under way across the English Channel, Harrison's "Suggestion Armada" had enlisted 300 ideas. The final total for the two weeks was 871.

Because every outstanding employee idea adopted at Harrison is automatically forwarded to Washington by the War Production Drive Committee and the suggestion sub-committee, headed by Miss Mildred Parks, Harrison has long been identified among the leading committees of the nation for quantity and quality of production suggestions.

### *Evaluated by Experts*

Ideas submitted to War Production Drive Headquarters in Washington are regularly evaluated for WPB honors by distinguished technical experts comprising WPB's Board for Individual Awards. Highest honor attainable by a war worker is the Citation for Production Ideas, rarely given. Highly coveted are the Certificate for Production Ideas and the Honorable Mention.

These three categories of national honors have been bestowed by WPB for approximately two years. RCA Victor Division, Harrison, has received a total of 75 national awards, including 13 Certificates and 62 Honorable Mentions, as of July 1, 1944.

RCA Victor Division, Camden, leads all RCA manufacturing plants, however, both for total ideas submitted and percentage adopted since Pearl Harbor through April, 1944. Camden employees have responded to the call of their War Production Drive Committee with an avalanche of 24,334 suggestions, of which 10,617, representing 43.6 per cent, have been adopted, thereby accelerating and improving tremendously the output of RCA equipment for the armed forces of the United States and our Allies.

### *Plant Totals Listed*

The following table eloquently tells the story of RCA "thinking for Victory" from Pearl Harbor until last May 1:

| Plant | Number of Suggestions | Number Adopted | Percentage Adopted |
|---|---|---|---|
| Bloomington | 4,924 | 710 | 14.4 |
| Camden | 24,334 | 10,617 | 43.6 |
| Harrison | 9,926 | 3,485 | 35.1 |
| Hollywood | 213 | 84 | 39.4 |
| Indianapolis | 6,329 | 1,423 | 22.5 |
| Lancaster | 2,223 | 569 | 25.6 |
| Total | 47,949 | 16,888 | 35.2 |

On two occasions in Washington, the spotlight has been focused upon RCA employees especially invited to the Nation's Capitol to receive signal honors for ideas.

Radiomarine, latest RCA company to install a suggestion system, in awarding eighty-two prizes for the best of 568 suggestions submitted for its opening two-week period, gave two top prizes of $25 each to James Dooley of the Machine Shop and Harold L. Grant of Shop No. 2. Ernest J. Patane, Personnel Chairman, is the Suggestion Committee Chairman. Widespread in scope, contributions received to date include ideas affecting improvements in efficiency and production, safety and benefits to health, and cures for tardiness and absenteeism.

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Buy War Bonds

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# HARBORD IS CONFIDENT OF INVASIONS OUTCOME

*RCA Board Chairman, A.E.F. Chief of Staff in World War I, Outlines Difficulties of Landing Forces.*

WHEN the great invasions of Europe get under way, Americans can be confident of the ultimate results, Lieut. Gen. J. G. Harbord, Chairman of the Board of the Radio Corporation of America, told members of the Historical Society of Pennsylvania meeting in Philadelphia on May 19, but he warned that "we will do our fighting men an injustice if we overlook the tremendous difficulties involved and expect an overnight miracle."

General Harbord, who served as Chief of Staff of the American Expeditionary Forces in France in the last war, cited what he described as a "hypothetical invasion" by an army of 250,000 men to bring out the multiple problems of establishing a foothold on enemy-held soil. He said that for a force of that size more than 1,750,000 tons of equipment would have to be landed with the invaders, and at least 250,000 additional tons of supplies would have to be landed each month, to say nothing of replacements in men and materiel.

"Suppose the leader of the invasion encountered no special problem because of enemy air attacks or enemy submarine attacks," General Harbord declared, "he would still have enough regular and routine problems. When supplies come ashore, warehouse space and storage space must be found for them. He would need 2,000,000 square feet of open storage space and some 1,750,000 square feet of covered storage space. He would need to arrange for the arrival of more than 30 cargo ships a month and their unloading.

### *Problem of Supply*

"If the invasion leader intended to push the enemy back—and make the invasion more than a mere landing — he would have to discover what rail facilities were available for taking his supplies forward, what their capacity was, the state of the rolling stock and the roadbed, what the census of the motor truck pool was, how many trained men would be available to keep the railroads functioning and the trucks running."

These are only part of the task, according to General Harbord, who commanded the 2nd Division during the battles of July, 1918, in the great Soissons offensive. He related how, in addition to the supply problem, there are always the fundamental problems of strategy and tactics, involving skillful use of sea and air power, landing forces and reserves.

"Theories, as well as men, perish by the sword," the general declared. "What is important is to make certain that we are armed against the chances and changes and accidents of war. The commander who brings 250,000 men to solid footing on a hostile shore is at the end of one chain of chances, changes and accidents. We must remember that he is only at the beginning of another chain of chances, changes, and possible accidents."

Aside from the problem of defeating the enemy and throwing him back, a multitude of problems arise the moment an invasion starts, General Harbord continued. In Sicily, for example, the Allied Forces took on, simultaneously with the task of expelling the enemy forces from the island, the job of restoring the life of the civil population to as nearly normal as possible. Other problems run the gamut, he said, from caring for the wounded, fighting disease and maintaining morale, to mastering new topography, bridging rivers and repairing enemy demolitions.

In the opinion of General Harbord, the American soldier faces these obstacles armed not only with the finest equipment but with an ingenuity typical of those who have fought successfully before for freedom and democracy.

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## Lancaster Wins "E"

*On April 24, the Army-Navy "E" Award for Production Achievement was presented to the workers of the RCA Victor Division's plant at Lancaster, Penn. The "E" flag and pins, emblematic of the award, were presented respectively by Brig. Gen. John H. Gardner, U. S. Army, and Capt. L. B. Blaylock, U. S. Navy. Holding the flag in the picture at left are, left to right, J. A. King, Lancaster Plant Manager; Captain Blaylock, Brigadier General Gardner, and Walter L. Kohr, President of Local B1165, I. B. E. W. Lancaster is the fourth plant of the RCA Victor Division to receive the coveted "E" award, the others being Camden, Harrison, and Indianapolis.*



LIEUT. GEN. JAMES G. HARBORD, CHAIRMAN OF THE RCA BOARD OF DIRECTORS, PRESIDES AT THE ANNUAL MEETING OF STOCKHOLDERS. IN THE BACKGROUND ARE THE SIX ARMY-NAVY "E" FLAGS, THE VICTORY FLEET FLAG, AND THE "M" PENNANT WON BY VARIOUS UNITS OF RCA FOR OUTSTANDING ACHIEVEMENT IN THE WAR EFFORT.

# RCA STOCKHOLDERS MEET

***Company Has Developed for the Armed Forces More than 150 New Electron Tubes, 300 Types of Apparatus Not Manufactured Before, Harbord Reports.***

THE Radio Corporation of America has developed for the armed forces more than 150 new electron tubes and approximately 300 types of apparatus not manufactured by any one before the war, Lieut. Gen. J. G. Harbord, Chairman of the Board of RCA, disclosed May 2 at the 25th annual meeting of RCA stockholders in a studio of the National Broadcasting Company in New York. He reported that unfilled orders for RCA products form a backlog of approximately $300,000,000.

General Harbord, speaking for the Directors in the absence of Colonel David Sarnoff, President of RCA, who is overseas on active duty with the Army of the United States, announced a gain in volume of production of the Company in the first quarter of 1944, but revealed that net profit, after Federal Income taxes, was $2,401,000 —a decrease of $191,000, or 7.5 per cent, compared with the same period last year.

Consolidated gross income of RCA during the first quarter of 1944, was reported to be $78,809,000 compared with $67,284,000 in the first quarter of last year, an increase of $11,525,000 or 17 per cent. Net profit before taxes amounted to $10,413,000, 16.5 per cent above the same period in 1943.

General Harbord said Federal Income taxes amounting to $8,012,000 are provided for in the first quarter of this year. This represents an increase in taxes of $1,671,000 or 26.3 per cent over the first quarter in 1943.

### *Earnings for First Quarter*

Earnings per Common share of stock before estimated Federal Income taxes for the first quarter in 1944 were 69.3 cents, while earnings per Common share after the taxes were 11.6 cents a share. Estimated Federal Income taxes were 57.7 cents per share. A year ago the first quarter earnings per Common share before Federal Income taxes were 58.6 cents per share, the taxes 45.7 cents per share, and after taxes were 12.9 cents per share.

Recalling to stockholders that RCA's production of vital radio, sound, and electronic equipment for the armed forces and the United Nations in 1943 exceeded by more than 100 per cent that of 1942, General Harbord declared:

"Victory, while surely ahead, is not yet in sight. We, too, must be untiring in our efforts to defeat the enemy. It is for us to do our utmost on the production line, on the invisible lines of communications and on the home front—to work as never before to support the valiant efforts of our fighting men."

General Harbord said that RCA's scientists and those of other laboratories are given primary credit for decisive victory over the U-boats, and expressed the belief that "this epic of the sea and the triumph of science will be one of the great stories" for future generations. He remarked that while it now is possible only to mention the "magic term radar", radio is achieving "almost unbelievable" results in navigation and collision prevention and peacetime application of radar will contribute to the safety of all kinds of travel.

"In attaining our excellent record of wartime production and communication services," General Harbord asserted, "both management and workers have cooperated harmoniously and with constantly increasing efficiency. Labor-Management War Production Drive Committees, sponsored by the government, have been successful in operation."

The production achievements of RCA, it was pointed out, have been recognized by the government in the award to RCA plants and Laboratories of six Army-Navy "E" flags, and eight stars, each representing an additional six months of continued excellence in accomplishment. These flags were on display at the meeting.

Further recognition of the skill and industry of RCA war workers has been evidenced by many individual awards from the War Production Board for suggestions that have aided production, and many commendatory letters and messages have been received from Government officials and leaders of the Army, Navy and Air Forces.

The magnitude of the production task, it was stressed, "is only realized when we consider the tremendous demands of war in equipping an Army of more than 7,000,000 men, a great two-ocean Navy, and an ever-expanding Air Corps of thousands of planes." There has been a demand on the radio industry for "millions" of electron tubes of all sizes, and great numbers of transmitters, receivers, antennas and other vital instruments and equipment.

"RCA has handled a vast amount of research and engineering for the armed forces," General Harbord reported. "This fact is illustrated by the number of new devices—including more than 150 new electron tubes and approximately 300 different types of apparatus—built since the beginning of the war but not previously manufactured by any one."

### *Refunds to Government*

Military secrecy prohibits disclosure of the nature of these devices.

He declared that RCA was proud of the opportunity to share with American industry the gigantic undertaking of supplying the fighting fronts. Volume of products and services of RCA manufacturing plants was revealed to have increased to $222,000,000 in 1943, or 73 per cent over 1942, and unfilled orders total a backlog of approximately $300,000,000, he reported.

"It is the basic policy of the Company in its war effort," he added, "to reduce the prices of manufactured equipment as fast as designs are final and lower costs in manufacturing are possible. As a result, voluntary price reductions and refunds to the Government apart from renegotiation proceedings, totaled upwards of $22,000,000 in 1943."

In the field of broadcasting, General Harbord told the stockholders, the "war needs of the Nation and the public interest are our guiding factors in our activities." He recalled that within the last two months the National Broadcasting Company has announced its policy regarding the future of television and FM, recognizing television as the capstone of the radio structure. He said NBC proposes to "contribute the utmost to the earliest possible development of television as a national service and industry.

In order to establish anchor points of a television system NBC has filed applications with the Federal Communications Commission for construction permits for stations in Cleveland, Chicago, Denver, San Francisco, and Los Angeles, it was reported. NBC plans to operate these stations as it now does WNBT, its pioneer television station in New York. Applications have been filed for permits for FM stations in cities where the network maintains studios.

Describing RCA's world-wide circuits as "vital arteries of communication," General Harbord disclosed that RCA's automatic transmitters and receivers now are able to handle 650 words a minute compared with the rate of 30 to 40 words a minute handled by wireless during World War I. With the cooperation of the War Department, RCA has built and is operating in Italy the first all-American commercial radio station on the Continent of Europe.

Marine radio activities, conducted by the Radiomarine Corporation of America, since the outbreak of the war have been devoted to the design, production, installation and servicing of marine radio apparatus for the armed services, the Maritime Commission and the War Shipping Administration, General Harbord reported.

### *New Products Planned*

In conclusion, General Harbord said:

"Alert to its post-war responsibilities and opportunities, RCA looks ahead without slackening its effort to win the war. National conversion to peace will be a stupendous task. It cannot be accomplished overnight. Therefore, it must be planned with foresight for the benefit of the Nation, the American economic system, and the maintenance of employment. New products, new efficiencies in production and in merchandising are being planned by RCA. We are determined to do our utmost to keep America in the forefront of industrial progress and particularly in the art of radio and television.

"When this conflict is over, much of the radio we knew at the time of Pearl Harbor will be old and obsolete. The trumpets which signal 'Cease Firing' at the end of this war will sound the reveille for the Age of Television.

"Our Corporation will answer the epoch-making challenges of peace with efficiency and speed. RCA research and pioneering—the spearheads of progress — will open the future to new inventions and services for the benefit of a better world."

## Laboratories Win Star

In recognition of continued achievement and meritorious service in the United States war effort, a second star has been added to the Army-Navy "E" Flag won in 1943 by RCA Laboratories, Princeton, N. J., a letter from the Navy Department announced June 21.

Writing to O. S. Schairer, Vice President in Charge of RCA Laboratories, Admiral C. C. Bloch, USN (Ret.), Chairman of the Navy Board for Production Awards, said: "The men and women of your plant have continued to maintain the high standard they set for themselves when they were originally awarded the Army-Navy "E". They may well be proud of their achievement."

The new star represents six months of continued achievement and is the symbol of appreciation of the armed forces. RCA Laboratories—one of the world's foremost centers of radio and electronic research—received the first star on January 15, six months after winning the flag.

## Retailers See Television

A practical demonstration of the possibilities of postwar television in the field of retail store merchandising was staged May 25 in Radio City by NBC and RCA for 22 representatives of retail organizations comprising the Associated Merchandising Corporation.

## NBC RECORDING STUDIO PRODUCES ARMY SERIES

*Urgent Needs for Fighting Men, Wacs and Nurses Described in Recruiting Service Programs.*

U. S. ARMY paratroopers land behind Jap lines in Burma! Engineers construct new airfields on recaptured Dutch New Guinea! Over Europe our Army Air Corps men deal death and destruction to the enemy! Within earshot of Nazi artillery on the Italian front Army nurses and doctors mend the wounded and save American soldiers' lives a thousand times a day! At Army installations here at home and abroad Wacs are performing 239 vital Army jobs!

### *Transcribed Radio Series*

On the surface all of these may seem remote from an NBC recording studio in New York's gigantic RCA Building but many of the men and women in the Army are on their victory-winning assignments as a direct result of the work that goes on in NBC Studio 9B every other Saturday afternoon. On these alternate Saturdays, the Army produces the "Voice of the Army," an official transcribed radio series devoted to recruitment of Army personnel for all branches of the service. Through this program, the U. S. Army Recruiting Service has obtained thousands of additional men and women needed to bring about a speedy victory. The "Voice of the Army" has made it possible for the War Department to notify millions of radio listeners, in the shortest possible time, of its urgent needs for fighting men, Wacs and nurses.

The program, now in its 198th week of continuous presentation, is prepared and produced under the supervision of the Recruiting Publicity Bureau, U. S. Army, headed by Col. LeRoy W. Yarborough.

"Voice of the Army" transcriptions are manufactured and distributed by RCA's Camden, New Jersey, plant. Every two weeks, the double-faced disks are shipped to 800 radio stations throughout the United States. The program is heard locally outside our continental limits in Alaska, Puerto Rico, and Hawaii.

Presentations are based on the Army's current personnel needs as they arise from time to time. In the past, when there were calls for paratroopers, engineers, and aviation cadets, the program devoted many in its series of dramas to these Army components. Because of the Army's present requirements for more Nurses and Wacs, current programs deal mainly with the Army Nurse Corps and the Women's Army Corps.

All "Voice of the Army" programs are produced under the supervision of Major North Callahan, executive officer of the Recruiting Publicity Bureau. Earle McGill, radio veteran, is director.

The musical signature of the show is a rousing song titled the "Voice of the Army", composed by Major Callahan and Norman Cloutier, NBC composer and conductor. Recently, the War Department adopted the tune as the official song of the U. S. Army Recruiting Service.

## BEAL SEES TELEVISION AS TOOL OF INDUSTRY

*Tells Detroit Engineering Society of Potential Applications of New Service to Manufacturing.*

DISCLOSURE of potentialities of television as a new and effective aid to industry after the war enlivened a meeting in Detroit on April 21 at which Ralph R. Beal, Assistant to the Vice President in Charge of RCA Laboratories, told members of the Engineering Society of Detroit of the imminent expansion of this promising art and science.

Declaring it "indeed appropriate" to make his revelations in "one of the world's most forward-looking and busiest industrial communities," Mr. Beal envisaged television as the coming "eyes" of factories, the "means of coordinating activities in giant manufacturing plants, such as those in Detroit, and the means also of peering into places and situations that might be inaccessible or extremely hazardous to man."

Mr. Beal said that those like himself who are close to television foresee the day after fighting ceases when this type of television application may be in wide use.

"We know now," the research engineer declared, "how it can be used to extend the eyesight of the plant manager to critical operations that ordinarily would require much time and effort to reach for personal inspection or which might even be inaccesible — how television can aid immeasurably in plant control.

### *Assembly Line View*

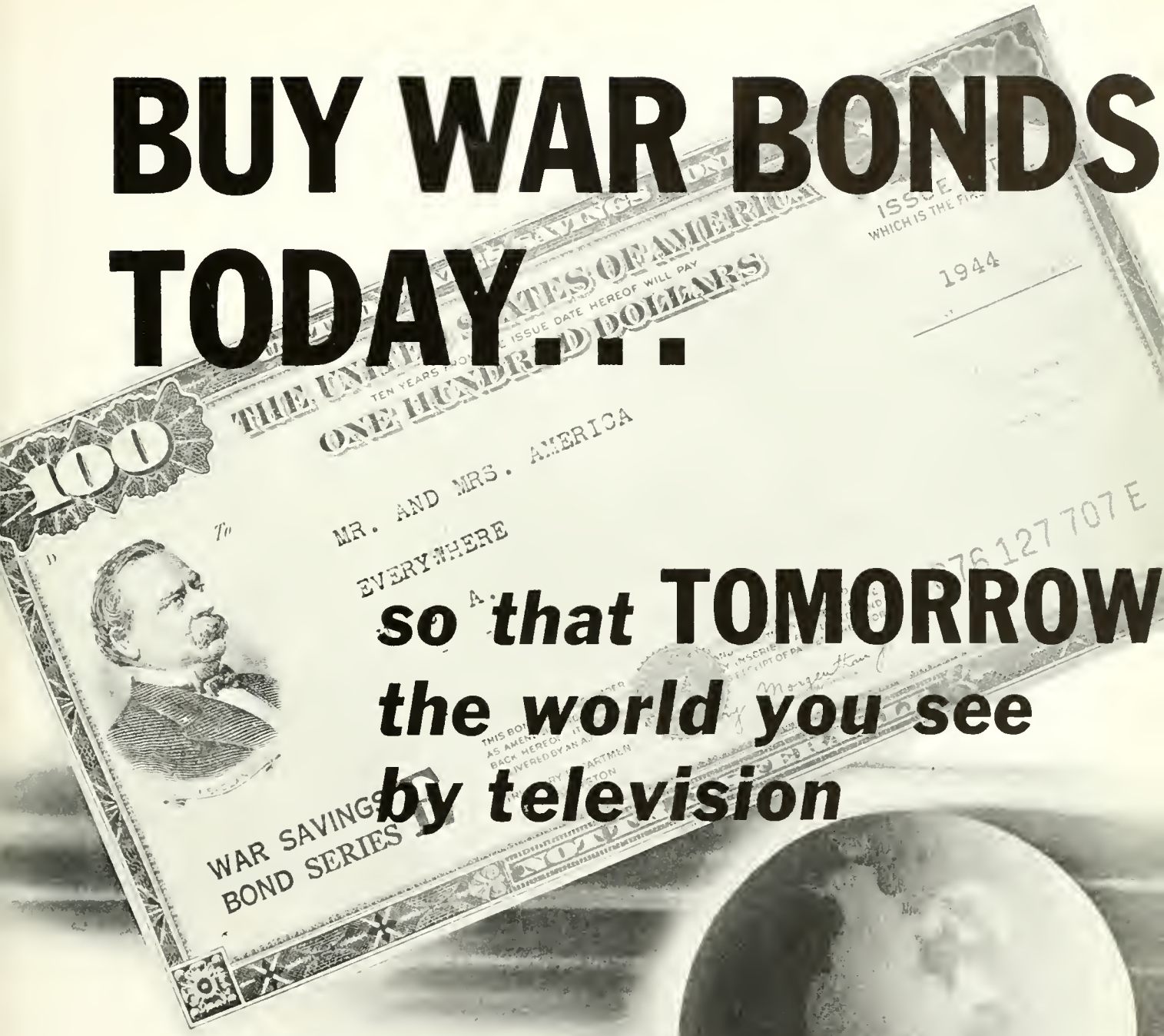
"Television cameras at strategic points can be connected by wire to receivers where production experts, foremen and supervisors can follow the flow of fabricated or raw materials and watch the progress of the work. Such setups will be particularly valuable in mass production assembly lines, and they may be extended to include loading platforms and shipping rooms."

According to Mr. Beal, television cameras may be used in connection with chemical reaction chambers, making visible to the operator without personal risk the chain of events occurring in complicated chemical production units, and thus enable him to control the process with optimum results. He said specially-built cameras may be used in furnaces to observe steps in the formation of alloys, and others may solve vital problems of analysis in important industrial processes.

"In addition," Mr. Beal declared, "television equipment may facilitate port movements of ships. The cameras located fore and aft, and on port and starboard sides of vessels, could lessen the hazards of docking and insure safety in crowded shipping lanes.

"We likewise foresee the use of television in metropolitan traffic control and along congested motor routes. Cameras may be installed permanently at busy inter-sections to flash to traffic headquarters running, up-to-the-minute picture accounts that should greatly aid traffic experts in easing congestion."

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# RADIO AGE

RESEARCH · MANUFACTURING · COMMUNICATIONS · BROADCASTING

1919 1944




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# Nerve Center of 145,000,000 Words...




## A MIRACLE OF GROWTH IN 25 YEARS

Twenty-five years ago, in 1919, R.C.A. Communications sent its first radiotelegraphic message. Filling a world-wide need, revealed by World War I, over 6,000,000 words were transmitted in the first full year of service.

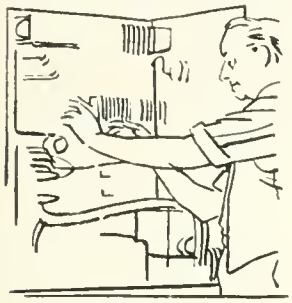
Since that first year of service RCAC's transoceanic service facilities have been continually expanded and improved. More and more, through these 25 years, radio communication has been accepted as an invaluable service to the public. Thus in this silver anniversary year, despite wartime restrictions, it is expected that a staggering total of 145,000,000 words, *nearly 25 times* the first year's volume, will have been transmitted.

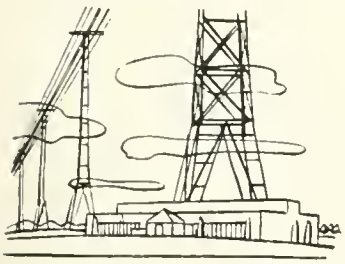
Today, the many millions of words which flow through RCAC circuits are fundamentally doing a war job. They are messages of strategic military importance or words of comforting news from home to the members of our overseas forces. Tomorrow, RCAC will continue its steady expansion—will do its part through efficient communications to bring the world closer together—thus helping to create a better understanding and to preserve a lasting peace among all nations.

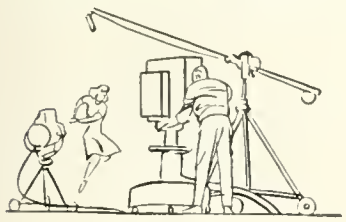
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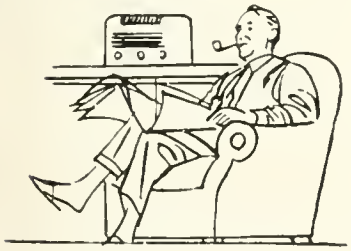
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THIS ISSUE: Here on review is radio's great forward m a r c h — RCA's first 25 years as an all-American industry and service to the Public.

# RADIO AGE

RESEARCH · MANUFACTURING · COMMUNICATIONS · BROADCASTING

VOLUME 4 NUMBER 1
OCTOBER 1944

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# Twenty-Five Years of Radio



CANDLES on the 25th birthday cake of RCA typify more than the passing of the years. Like wireless towers the candles stand as sentinels of the past, their lambent flames reminiscent of the radiant sparks kindled by the wireless pioneers. As man in his electronic conquest of the ether approaches the frontiers of light, he becomes more and more aware that radio and light are akin. Now he knows that he can see by radio as well as hear.

### *A Symbol of Achievement*

"The Story of RCA" is a story of twenty-five years of pioneering and progress. Radio has passed through almost fifty years since Marconi's first signal yet there is no radio device in its original form now in practical use that dates back to 1895. Time also has replaced the instruments of 1919. The past twenty-five years have been crowded with great activity in radio; the pace of progress has been swift.

Always there are new inventions and new opportunities. The men of RCA, alert to the challenges and opportunities of science have brought into use many of the outstanding developments in the field of radio. As a result, RCA is a symbol of achievement in the science of radio and electronics, in the art of broadcasting and in the service of worldwide communications.

RCA has carved out its destiny with the electron tube as a mighty tool. In 1919 the challenges of radio were as boundless as the ether and twenty-five years have not diminished, but make it clear that the future of radio is always greater than its past. The electron tube lights the way into the wilderness of space—into the ultra high-frequency spectrum of the ether in which new trails of communication are being blazed. The First World War revolutionized radio; so has the Second.

### *An Unforgettable Story*

News of the Armistice in 1918 was flashed around the world by the dots and dashes carried on the long waves of wireless. The curtain went down on the first quarter century of radio. In a brief interlude between 1919 and 1920, the communication props on the world-wide stage were shifted. When the curtain went up in 1920 the radio setting was transformed as if a miracle had happened. The crystal detector was supplemented by the electron tube. So was the spark transmitter and many instruments that made the romance of wireless an unforgettable story. Alongside the wireless key there was the microphone through which man might talk and sing. Short waves had been harnessed to encircle the earth.

As a science, an art and an industry, radio was on the threshold of a new era. The silver-coated bulb of the electron tube was a new crystal ball of science in which the men of radio saw the old order of electrical things disappear and the electronic future spread before them. They saw the dreams of Marconi, Tesla, Lodge, Crookes and others coming true.

Within twenty-five years more than 21,777,000 RCA radio and phonograph instruments have been put into use throughout the world; since 1930 RCA Victor has produced 294,000,000 phonograph disks performed by the world's great artists. There are 1,000 broadcasting stations in the United States; 325 use RCA transmitters. The hemispheres are criss-crossed by invisible waves carrying millions and millions of words to the far corners of the earth; RCA operates more than 50 direct radiotelegraph circuits between the United States and foreign countries. No ship on the Seven Seas need be out of touch with land, or with its home port; approximately 80 percent of the American Merchant Marine is equipped with RCA apparatus. More than 60,000,000 broadcast receivers put the homes of America in tune with all the world. America's No. 1 Network—operated by the NBC — comprises 146 stations from coast-to-coast. Since 1930, RCA alone has sold more than 452,000,000 electron tubes, and today millions of them are in service in countless homes and on every fighting front.

### *The Promise of Television*

Television, today, is testing its electronic eyesight just as the radiophone was testing its voice in 1919. As soon as this war is over the curtain of Time again will drop, and again all the props of communications will be shifted for a new act. The scene will be television—a camera alongside the microphone just as the microphone took its place alongside the wireless key in 1920. And the new camera will have an electronic eye as sensitive as the human optic, for it will see all that the eye can see in a room lighted by the candles on a birthday cake.

David Sarnoff

President,
Radio Corporation of America

# Radio's Great Role in the War

*GENERAL HARBORD TRACES ADVANCES IN RADIO SINCE THE FIRST WORLD WAR AND DISCUSSES APPLICATIONS OF RADIO-ELECTRONICS IN COMMUNICATION SO VITAL IN GLOBAL WARFARE*



By Lieut. General James G. Harbord

*Chairman of the Board,*
*Radio Corporation of America*

SINCE the dawn of recorded history, when couriers from lookout posts already were being employed to dash back to their command headquarters with news of approaching enemies, communication has been a vital factor in battles and wars. For centuries in more recent times military experts have studied intently its application to their profession. Yet never in any comparably brief span of years in all the written story of mankind has there been such a striking advance in the military use of communication as has come between the First World War and the current one.

An absolutely complete and detailed account of the part being taken in the present conflict by radio communication and its related developments in radio-electronics would fill more volumes than could be piled into an Army jeep. A full report on radio in the First World War, which seemed to us spectacular at the time, would not take long to dispatch over RCA's automatic transmitters and receivers of today, which are capable of handling 600 words a minute as compared to thirty to forty words attained in World War I.

On the day after the First World War was declared, the importance of the infant art of radio was emphasized by a Presidential proclamation, directing the Navy to take over all radio stations in the United States and its possessions with the exception of those the Army already controlled. With the aid of engineering personnel and apparatus supplied by American radio companies, the Navy was prepared after this order was carried out to handle the communication requirements of its own forces, as envisaged in that period.

The Navy was far from prepared, however, to take up the overflow from the transatlantic cables when they became loaded to capacity as great numbers of our troops arrived in Europe. Yet it was apparent that if Germany should succeed in cutting our cables, radio would have to be depended on to supply our only telegraphic communication with our own Expeditionary Force and with our Allies. General Pershing strongly emphasized the need of direct radio channels. Even after improved stations capable of transmitting to Europe had been made available, the Navy still had the problem of return messages. It is an indication of radio's state of development in that era that extensive experiments were necessary before an effective transatlantic receiving station, with 150 operators, was established at Bar Harbor, Maine.

Working with the Army and the French Government, the Navy also undertook the construction of the Lafayette radio station near Bordeaux, an establishment of the 1,000-kilowatt arc type. A 500-kilowatt arc type station was built at Annapolis to supplement this. In what was then considered a most dramatic move to combat German submarines in European waters, fourteen two-kilowatt shore stations were erected in Ireland and France to cooperate with early-model aircraft scouting rather gingerly along the coasts. When it was later revealed that radio equipment was supplied and maintained by our Navy on approximately 1,500 vessels during the war, Americans who heard of it were amazed by the size of the accomplishment.

The dire danger of the submarines also forced the development of the radio direction finder into a practical instrument, after various navies had been dabbling at it experimentally since 1912. The device told the British that the German High Seas Fleet had left harbor, and led to the Battle of Jutland, because the Kaiser's fleet unsuspectingly kept using its radio transmitters. Direction finders later supplied information on sub-

TWO PRIVATES OF THE U. S. AIR FORCES CARRYING OUT THEIR VITAL COMMUNICATIONS DUTIES IN A BOMBER EQUIPPED WITH AN RCA LIAISON AIRCRAFT RECEIVER.





TWENTY-FIVE YEARS AGO, THE CUMBERSOME RIG ON THIS BIPLANE'S TOP WING WAS DEVELOPED AS A RADIO DIRECTION FINDING LOOP ANTENNA.

BELOW: IN THIS WAR, SOLDIERS MAINTAIN INSTANTANEOUS VOICE COMMUNICATION WITH FIELD COMMANDERS BY MEANS OF THE "WALKIE-TALKIE."



marines which caused United States transports to be routed from Brest to avoid attack.

One of the knottiest radio problems taken on by the Navy in the First World War was the creation of apparatus suitable for use in aircraft. Ignition interference which prevented reception of all but the clearest signals had to be overcome. Yet the weight had to be light enough to fly in the little planes of 1917 and 1918. It is understandable why the Navy was proud to be able to announce that it had fitted seventy-five planes with spark type transmitters and vacuum tube receivers before the Armistice was signed.

Our Army entered the war with field radio equipment much the same as we had had in 1914. In the meantime, France and England had profited by three years of intensive development, having realized through bitter experience that Army radio had to be changed greatly to meet the demands of trench combat in which service distances were short and light weight was a tremendous asset. So our Army adopted the radio equipment of the French Army, but created a research program of its own. A laboratory and field test section was set up by the A.E.F. in France, and a research bureau was established at Camp Vail, N. J., supplemented by the Signal Corps Laboratory and Bureau of Standards in Washington.

The basis for the amazing expansion of American radio's uses in the Second World War began to be laid very soon after the Armistice of 1918. The First World War had proved what could be accomplished by directed research and the adjustment of claims and counter-claims of rival organizations, each holding essential patents and none capable of building a complete radio communication system without the others. To end this deadlock, the Radio Corporation of America was formed, with the sympathetic cooperation of our Government. Other strong competitive companies came later. The years between the wars developed radio communication and electronics to a point which changed the daily life of the nation.

No more striking demonstration of radio's efficiency and versatility could be imagined than the uses to which it now is being put on our fighting fronts and all the embattled seven seas. Much of the story cannot yet be told, for reasons of military security.

American radio has been in the war from the first, as an eager volunteer. The production of its devices—all for the armed services—now totals $250,000,000 a month in the United States, by the latest available reports.

The demand on the radio industry for millions of electron tubes of all sizes, great numbers of transmitters, receivers, antennas and other essential equipment can be realized only when we think of the size of our 7,000,000-man Army and two-ocean Navy. They are fighting what might almost be called a "radio war," because the science of radio-electronics is playing such a conspicuous part for victory.

The part which radio, in all its various phases, is taking in the present war, will bring great advances in radio in the post-war era. The intensified research and the experience now being gained under the exacting conditions of life and death struggle will be turned to the uses of peace. We have reason to expect a forward surge in radio-electronics when this war ends that will be comparable to the great strides of radio-electronics after the First World War.



U. S. SAILOR "PIPES" ORDERS THROUGH TRANSMITTER OF RCA INTERIOR COMMUNICATIONS EQUIPMENT USED ON BATTLESHIPS AND AIRCRAFT CARRIERS.

# 18 YEARS IN BROADCASTING

*NBC Since Formation in 1926 Has Established Many Records in Providing "the Best Programs Available for Broadcasting in the United States."*



By Niles Trammell

*President,*
*National Broadcasting Company, Inc.*

NETWORK broadcasting is the joint product of many interrelated activities. Each of these activities is indispensable to the final result, yet each is dependent upon all the others. A book might be written about any one of them, and how it has contributed to the broadcasting service initiated by Radio Corporation of America and carried on since 1926 by the National Broadcasting Company.

After broadcasting over a makeshift antenna the historic Dempsey-Carpentier fight, which took place in Jersey City on July 2, 1921, RCA built Station WDY in Roselle Park, New Jersey, which went on the air with its first program on December 14th of that year. By February, 1922, RCA had transferred its broadcasting activities to Station WJZ, which it operated on a partnership basis with Westinghouse, the owner of the station. In the Spring of 1923, full ownership of WJZ was acquired by RCA.

Station WEAF, which was bought by RCA in 1926 when NBC was formed, had been established by the American Telephone and Telegraph Company in July, 1922. A month after it first went on the air, WEAF broadcast the first commercially sponsored radio program, on behalf of the Queensboro Corporation, a real estate firm.

The following January, the first network program in history was carried by two stations connected by telephone wires—WEAF, New York, and WNAC, Boston. The program was a five-minute saxophone solo, but it was the beginning of network broadcasting.

When NBC was established in 1926, WEAF was the key station of its network. That the idea of a national network was immediately successful, and necessitated the creation of a second network only a few weeks after the first was formed, testifies to the soundness of the idea without detracting from the pioneering courage of NBC's founders. WJZ occupied a key position in the second NBC network, and remained an important NBC station until the separation of the Blue Network from NBC in 1942.

### *NBC Affiliates Increase*

The original NBC Network comprised twenty-one stations and extended only as far west as Kansas City. By February, 1928, several stations on the Pacific Coast had become affiliated with NBC and on December 23, 1928, the network was fully established on a regular coast-to-coast basis.

The number of NBC affiliated stations has grown gradually and steadily through the years. Today, there are 150 stations in the full network—145 within the continental United States, three in Canada, one in Hawaii and one in Cuba. NBC itself owns only six stations: WEAF, New York; WRC, Washington; WTAM, Cleveland; WMAQ, Chicago; KOA, Denver; KPO, San Francisco. The remaining 144 stations are owned and operated by separate business organizations and associated with NBC in a contractual relationship.

The roster of NBC clients is a Blue Book of American industry and commerce. It is interesting to note that whereas 72 national advertisers sponsored programs over the NBC network during 1943, NBC had no less than 77 network clients during the year 1927. A comparison of NBC revenues tells a different story. The company's total revenue in 1927, its first full year of operation, was $3,760,000; in 1943 it was $49,000,000. There were 195 employees on the company's payroll when it started, compared with 2,286 on September 1, 1944. This increase is almost exactly proportional to the increase in the number of radio receiving sets in the hands of the public. In 1926, there were 5,000,000 receivers in the entire United States; in 1944, it is estimated that there are 57,000,000, of which 8,000,000 are in automobiles.

Music constituted approximately two-thirds of the network program fare in 1926. It now represents about half of NBC's total program time, although there are actually twice as many network program hours devoted to music today as there were eighteen years ago.

MUSIC AND SOUND EFFECTS ADD TO THE REALISM ACHIEVED BY ACTORS IN A DRAMATIC PRESENTATION FROM NBC'S RADIO CITY STUDIOS IN NEW YORK.





LEFT: FROM THESE LOFTY ANTENNA TOWERS ON LONG ISLAND, LISTENERS IN THE NEW YORK AREA RECEIVE PROGRAMS OF NBC'S KEY STATION WEAF. BELOW: NBC MASTER CONTROL ROOM FEEDS PROGRAMS TO AFFILIATED STATIONS ACROSS NATION.



The reason for this is that network programs are now on the air for sixteen or more hours a day, seven days a week. When NBC was established, WEAF was on the air approximately twelve hours each week-day and nine hours on Sunday; WJZ for approximately eight hours daily.

The Quiz type of program is not to be found in NBC's early schedules. It was only as recently as 1937 that this form of program became established. Dramatic programs filled only 2 per cent of NBC's total program time in 1926, compared with more than 26 per cent today. This increase of course is largely accounted for by the popular daytime serials.

### *News Reports Expand*

The program change of greatest significance is in the field of news and special events. Except for a few sports events, there were no news programs broadcast over the network in its early days. Such programs now occupy no less than one-fifth of the network's total program hours. NBC had no news reporters or commentators in 1926; today, it has forty on its regular staff, in addition to a large news department. While the war is in large measure responsible for the present emphasis on news broadcasting, there is every likelihood that after the return of peace the reporting of national and international news will continue to play a major role in NBC programming.

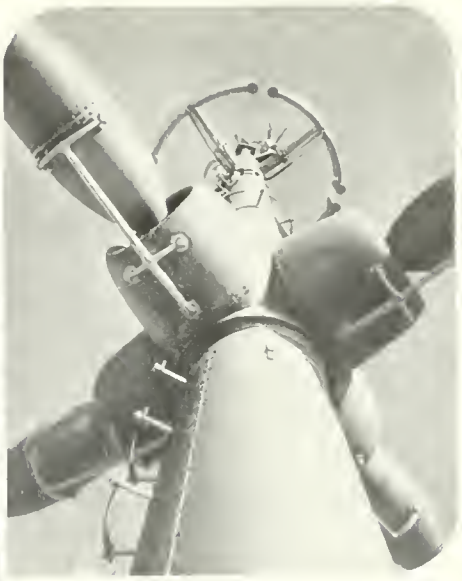
In 1926, the average number of Red network stations used on a sponsored program was nine, and on the Blue network, three. Today the average number of stations per commercial program on the NBC network is 110 in the evening and 85 in the daytime.

When NBC was formed, it broadcast no short-wave international programs. RCA, however, had in 1925 initiated international broadcasts to Europe over its Station W3XL at Bound Brook, New Jersey. This service was irregular until 1929, when programs provided by NBC were regularly broadcast via short-wave under the direction of RCA Communications, Inc. In 1930, this service was taken over by NBC, and has been a regular feature of the company's operations ever since. In November, 1942, the Government contracted for the full time of NBC's two 50-kilowatt international transmitters, WRCA and WNBI at Bound Brook, New Jersey. Since that time the seventy-six men and women of NBC's International Division have been engaged exclusively in the production and broadcasting of international programs in eight languages for the Government. This war service of facilities and personnel is rendered by NBC on a non-profit basis. It is certain that after the war the broadcasting of international programs will continue to be an important factor in America's foreign policy.

### *Pioneer With FM*

Eighteen years ago Frequency Modulation (FM) was scarcely more than a technical phrase, known only to radio engineers. By 1939, however, FM had begun to show promise as a technical improvement in broadcasting, and NBC erected its own FM Station W2XWG on top of New York City's Empire State Building. This was the first FM station to be established in New York City by any network broadcaster. It has been on the air regularly with FM programs since January, 1940. NBC has also applied to the FCC for additional construction permits for FM Stations to be installed in cities where the company maintains studios. In order to stimulate the progress of FM, NBC plans to make its network programs available to the FM stations operated by the company's network affiliates. Our objective is to make NBC programs available to all radio listeners,

RIGHT: TELEVISION PROGRAMS PRODUCED BY NBC'S PIONEER NEW YORK STATION, WNBT, ARE PUT ON THE AIR FROM THIS MODERNISTIC ANTENNA ATOP THE EMPIRE STATE BUILDING. BELOW: WNBT'S TRANSMITTING CONTROL ROOM.





whether they use standard band or FM receivers.

Television is a field which has held the close attention of the company's management and engineers ever since the formation of NBC. This company is the pioneer in television broadcasting in the United States, and has a long record of "firsts," both in engineering achievements and in the creation of television programs.

### *Develop Program Technique*

NBC engineers have helped to perfect present-day television cameras, studios and studio lighting, and transmission systems. Practically the entire technique of putting a television program on the air is an NBC product—from author's manuscript to actor's make-up.

The following dates stand out in historical importance:

*October 30, 1931* — NBC commenced television broadcasting from transmitter atop Empire State Building, New York, with 120-line pictures, in experimental tests of RCA semi-electronic system, employing mechanical-scanning camera and electronic receivers. Commencing in 1933, NBC broadcast programs with 240-line pictures, in first field test from Empire State tower transmitter of RCA all-electronic system.

*June 29, 1936* — Having reconstructed the Empire State tower transmitter on the basis of earlier tests, NBC began broadcasting programs in second field test of RCA all-electronic system, with 343-line pictures.

*April 20, 1939* — NBC's station WNBT inaugurated America's first regular television program service to the public, televising the ceremonies opening the New York World's Fair, with 441-line pictures broadcast throughout metropolitan area from Empire State tower.

*July 1, 1941* — Ten years after NBC television first went on the air, NBC inaugurated commercial television, broadcasting the programs of four advertising sponsors, with 525-line pictures. NBC had previously received the first commercial television license granted by the FCC, and had issued the first television rate card ever published.

With the exception of a brief period required in 1941 to adapt the transmitter and other equipment to new FCC standards, NBC's pioneer television station WNBT has been on the air continuously for five years, with regular weekly programs of sight-and-sound broadcasting. Within the past two years, NBC has established America's first television network, over which it furnishes a regular program service. It is for the present a modest three-station hook-up of NBC's station WNBT with WPTZ, the Philco station in Philadelphia, and WRGB, the General Electric station in Schenectady.

All members of the NBC organization share with the rest of the RCA family a tremendous and enthusiastic confidence in television as a great postwar industry and service. With the cooperation of the Government and of other members of the radio manufacturing and broadcasting industries we hope the full possibilities of television will be brought to realization early in the coming years of peace.

### *Guide to Future*

What I have said here about the past eighteen years of NBC history is a bare outline, with numerous omissions, of a fascinating period of pioneering achievement.

NBC started with only an ideal for guidance. Today, it has both the ideal and an eighteen-year tradition of faithful service to back it up. We could not ask for more trustworthy guides into a future that is full of significance and promise.

Buy War Bonds

# RADIO LINKS ALL NATIONS

*RCA Has Evolved Revolutionary Changes in International Communications—Radio Circuits Encircling the Earth Handle Millions of Words.*



By Lieut. Col. Thompson H. Mitchell
*Vice President & General Manager, R.C.A. Communications, Inc.*

A NEW ERA in the history of international telecommunications was born when the Radio Corporation of America a quarter of a century ago initiated its plans for a world-wide radio telegraph communications system centering in the United States.

A 1919 map of submarine cable routes would have shown how tenuous and insecure were the links connecting this country with the rest of the world. Across the Atlantic, a handful of slow and nearly obsolete cables landing only in Great Britain and France, with many of them foreign-owned; to South America, a tortuous system of short cable loops running from port to port down the West Coast of South America and thence across the Andes by landline to Argentina; and across the Pacific, just one slim thread of cable to serve Hawaii and all the Far East.

American telegrams to and from all other parts of the world had to pass over cable systems owned and operated by foreign interests, predominantly British. London was the communications center of the world. America's sole hope of becoming an important factor in world communications lay in radio and RCA set out to do the job.

On March 1, 1920, after months of painstaking preparation, the first RCA transoceanic direct radio circuits were opened. The most important was between New York and London. The others were between San Francisco and Honolulu, and between Honolulu and Japan. Direct circuits with Norway, Germany and France were established before the end of the year. Little by little, traffic volume increased, and stride by stride the research engineers and operating staff improved equipment and technique.

### *Meets First Big Test*

In the summer of 1922, several of the transatlantic cables were out of commission for a week or so, and and it was then that radio really demonstrated its latent potentialities. Under the pressure of sheer necessity RCA's transatlantic circuits handled a volume of traffic far exceeding theoretical capacity. Shortly thereafter, in April, 1923, transatlantic cable rates of all companies were reduced to meet those of RCA.

RCA was now beginning to hit its stride. Direct circuits with Italy and Poland were opened in 1923, and with short waves in the offing, new and reassuring possibilities in the way of long-distance communication began to loom up.

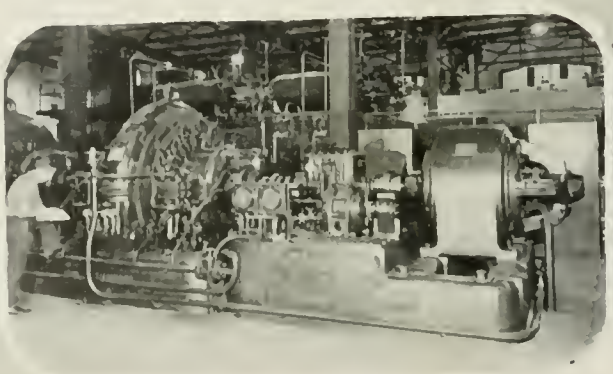
At the end of 1923, RCA had bridged the Atlantic and the Pacific, but had not been able to span the gap between North and South America. This was rectified in January, 1924, however, when the United States and Argentina were linked together by a direct 6,000 mile radio telegraph circuit — the longest radio telegraph circuit to be operated up to that time. Before the end of the year a new direct circuit with Sweden had also been opened. Short waves were now coming into their own.

With RCA's cable competitors now fully awake and determined to put the young radio upstart in its place, a new submarine cable connecting the United States with Italy by way of the Azores was opened in March, 1925. While RCA prepared to meet this new challenge in the Atlantic, the Commercial Pacific Cable Company deemed it an opportune time to lower its rates to Japan — thus equalizing with those of RCA and assuring more competition in the Pacific as well as in the Atlantic.

RCA had an ace of its own however, and countered by opening a

IN THE EARLY 20'S, RCA'S INTERNATIONAL RADIOTELEGRAPH SERVICE OPERATED WITH MASSIVE ANTENNA TOWERS (LEFT) AND ALEXANDERSON ALTERNATORS (CENTER), WHICH GENERATED LONG WAVES. TODAY, RELATIVELY SMALL WOODEN POLES SUPPORT ANTENNAS (RIGHT) FOR WORLD-WIDE SHORTWAVE COMMUNICATION.







direct circuit between San Francisco and the Dutch East Indies. This was the first extension of direct services in the Pacific area since 1920, although the vast communications possibilities of that region had long been recognized. The Pacific had been bridged, it is true, but pending the perfection of short wave transmission, Japan had to be reached by island-hopping, with Honolulu as the relay point.

Early in 1926, for the first time, news photographs, drawings, fashion sketches and other subject matter were flashed across the oceans. Commercial radiophoto service between San Francisco and Honolulu and between New York and London was made available to the public. During the nearly twenty years that have elapsed since radiophoto service was introduced, the speed of transmission has been tremendously increased; the quality of the received picture improved to the point where direct comparison with the original would not be unfavorable, and the cost has gone down. Also, direct radiophoto service from the United States has been extended to include Argentina, Australia, Egypt, Russia, Sweden and Switzerland, as well as Great Britain and Hawaii.

In 1926, also, RCA's now rapidly-growing network of international radio telegraph circuits was further expanded by the extension of direct service to Holland, Brazil and French Indo-China. RCA had long been working toward the goal of a world-wide network of direct circuits, and now that short waves made it possible to provide the necessary tools, little time was lost in pushing ahead.

In rapid succession during the next few years, RCA opened new direct radio circuits with almost bewildering regularity. North, South, East and West—North Atlantic, South Atlantic, the Pacific—all the etherways led to RCA at New York or San Francisco. It established its own stations in the Philippines, and from Manila proceeded to build up a network of radiotelegraph and radiotelephone circuits with neighboring countries and with other countries far and wide. It set foot in the West Indies and erected its own stations in Puerto Rico, Cuba, Haiti, and the Dominican Republic. It reached out to Belgium, Portugal, Spain, Turkey, Russia, Czechoslovakia, Switzerland, serving practically all of Europe with direct circuits. It brought Liberia, in Africa, Syria, in the Near East, and the Fiji Islands in the South Pacific, within hailing distance of the United States.

### *Programs Transmitted*

Commerce with our Latin-American neighbors was facilitated by new direct circuits with the Netherlands West Indies, Surinam, Colombia, Venezuela, Costa Rica, Chile, Panama, Mexico and Guatemala. The far reaches of the Pacific were no longer distant in point of time, for China, Tahiti, French Indo-China and Manchuria had become new affiliates in the RCA network.

The importance of the American public's being able to listen to—and hear intelligibly — programs originating in other countries and short-waved to the United States led RCA to develop its international Program Transmission Service, by means of which is handled a large proportion of the overseas broadcasts regularly heard by millions of listeners from Maine to California.

Similarly, programs originating in the United States may be transmitted overseas via RCA for rebroadcasting abroad.

When war clouds gathered over Europe, and finally broke, the international radio communication circuits of RCA became increasingly important. Submarine cables may easily be cut by enemy action, as the British, and later the Italians, demonstrated in the Atlantic and the Mediterranean. Radio circuits, however, are much more difficult to interrupt.

Pearl Harbor did more than precipitate the United States into the war. It made the nation communications-conscious. It did even more than that. It brought a realization that only radio could do the kind of job that would have to be done.

Pearl Harbor even broke down the long-continued resistance of the British to direct circuits between the United States and Empire points. Direct radio telegraph service with Australia was opened less than a month after we entered the war. It was then and is now a vital link in our military operations in the Southwest Pacific, and both ends of the RCA circuit have been equipped with RCA multiplex and 7-unit automatic and error-proof printer apparatus, the most modern and efficient type of terminal equipment yet developed.

Circuits with New Zealand, with Chungking and Kunming in China, New Caledonia, Bermuda, French West Africa and Iran followed in quick succession, and radio kept up with the war as it developed on a global scale. In the meantime, prior to Pearl Harbor, RCA had set up direct radio communication channels with Iceland, Greenland, St. Pierre-Miquelon, Belgian Congo, Finland, Martinique, Egypt and



LEFT: PHOTOGRAPHS FROM MAJOR WAR-FRONTS ARE FLASHED OVER RCAC'S RADIO-PHOTO SYSTEM TO U. S. NEWSPAPERS.

BELOW: HIGH-SPEED MULTIPLEX RADIO-TELEGRAPH PRINTERS TRANSMIT MESSAGES ACROSS THE SEAS AT THE RATE OF HUNDREDS OF WORDS A MINUTE.



French Equatorial Africa, so that wherever American or Allied interests were involved, radio was on hand to solve the communications problems.

Since 1943, French West Africa, Ecuador, Gambia and India have been added to the long list of RCA direct circuits, all of them serving military as well as commercial interests.

Early in 1944 at the request of the U. S. Army authorities, RCA sent to Italy two complete transmitting and receiving stations together with all necessary engineering and operating personnel for their installation and operation behind the Italian front. One station is at Rome and the other at Naples, and through them flow vast quantities of press messages and radiograms.

### *600 Words a Minute*

RCA as a prime factor in the international communications field has been the means not only of improving communications throughout the world, but also of bringing about very appreciable savings to American users by reducing telegraph rates wherever practicable. Since 1920, it is conservatively estimated that more than $100,000,000 has been saved to American and other users of international telegraph service as a result of rate reductions initiated by RCA. It is also computed that during the same period RCA has handled a billion and a half paid words over all of its circuits, which, including those temporarily suspended because of the war, provide a radio communication network connecting the United States directly with 58 other countries.

Geared primarily to serve the communications requirements of American business, RCA has other important customers, including the United States Government and the Press. Many of its contributions to the prosecution of the war must remain unrevealed for reasons of security, but they are important and effective. As for the Press, it is important that adequate facilities for the speedy handling of press traffic to and from all parts of the world should be provided. The direct radio channels of RCA are singularly well adapted to this purpose, and 'teens of thousands of words of press matter are sent and received over its circuits every day.

Even the present comparatively low press rates may be expected to undergo further reduction with the application of new and improved operating techniques that are now being developed, and by means of which handling costs may be whittled. Compared with transmission speeds of from 25 to 30 words a minute twenty-five years ago, speeds up to 600 words a minute are now being recorded. Instead of laboriously translating dots and dashes by ear, automatic and error-proof printers now provide printed copy requiring the minimum manual operation. By means of the time-division multiplex, RCA engineers have grafted four communication channels onto a single transmitter which formerly carried only one. The diversity receiver, also an RCA development, has been universally adopted all over the world as standard equipment.

### *Growth in 25 Years*

In many businesses, twenty-five years is only a period of time. To RCA, from its international communications aspect, it represents the growth from birth to full maturity of an idea. Within less than a decade after the organization of the Radio Corporation of America, its international communications business had grown to such proportions that it was found advisable to organize a separate company charged with the responsibility of continuing the development and operation of radio communication services and of enhancing the prestige of RCA in the eyes of all users of international telecommunications. For these purposes, R.C.A. Communications, Inc., was formed in January, 1929. Since that date, all of the communications services and other activities mentioned have been carried on by R.C.A. Communications, Inc., a service of Radio Corporation of America. Its routing indicator—*"Via RCA"*—is known and used over all the world. It constitutes assurance of accuracy, speed and economy in international communication.

Buy War Bonds




LEFT: AT OPERATING POSITIONS SUCH AS THESE, RCA MESSAGE TRAFFIC FLOWS TO AND FROM VIRTUALLY EVERY IMPORTANT SECTION OF THE WORLD. BELOW: TECHNICAL CONTROL OVER MORE THAN FIFTY INTERNATIONAL RADIO CIRCUITS IS MAINTAINED AT THIS DESK IN RCAC'S CENTRAL OFFICE IN NEW YORK.



# RCA MANUFACTURING GROWS

*Diversification, Building Better Products at Lower Cost Are Keys to Steady Expansion of RCA Victor — New Services Foreseen.*



By Frank Folsom

*Vice President in Charge, RCA Victor Division*

TO RCA's quarter-century of great achievement, the RCA Victor Division can add eighteen additional years of spectacular history, steeped in rich tradition and comprising one of the most fascinating sagas in American history.

In 1898, two men of vision labored hard in a Camden machine shop, seeking to perfect a curious mechanism, the "talking machine," which was destined to revolutionize the world's conception of home entertainment, and create a great new industry.

The story of how Emile Berliner and Eldridge Johnson met in a combination bicycle and machine shop often has been told. But no one can tell this story with greater authority than the founder himself. I'd like to quote him briefly:

"One of the very early types of talking machines was brought into the shop for alteration. The instrument was badly designed, but it caught my attention and held it fast.

"Mr. Berliner had given the world the greatest basic improvement in talking machines since the day of Mr. Edison's discovery, and I happened to be the man who was there at the right time to give this great discovery the needed improvements and refinements, and to manufacture it in such forms and designs most popular with the buying public.

"The Victor Company was a very small affair when it was first formed in 1901, but it has grown and will continue to grow as long as its products continue to grow better and better. The Victor Company is now in possession of many patents and secret processes, but our greatest secret process is this:

"We seek to improve everything we do every day.

"Improvements come hard nowadays. The field is no longer a virgin one. Great chunks of free gold are no longer lying around to be picked up by lucky hunters. The old fashioned prospector is out of the race. It is now necessary to dig according to the latest scientific methods and to keep on digging with the best equipment money can buy. What the public is eager to purchase today it cannot be sold tomorrow."

Mr. Johnson's words have as much significance to us now as they had to the Victor organization when he wrote them in 1914.

The famous Victor dog trademark became the property of the Victor Company, in 1902. The Victor Company pioneered in spending large sums of money in advertising. The Victor dog eventually came to be the best-known advertising symbol in the world.

### *Caruso Leads Way*

The year 1906 is another important milestone in Victor history. The Company had not been very successful in persuading outstanding performers to entrust their artistry to the talking machine. Enrico Caruso was then at the height of his fame. The idea of recording his voice fascinated Caruso and he consented. With Caruso showing the way, other great operatic and concert stars hastened to enter the field.

Heretofore, records had been merchandised through bicycle shops, hardware stores, and other unrelated retail outlets. Now, the Victor Company began to merchandise records through music stores and to increase its advertising. That is when the Victor Company began its quick climb to fame.

By the early 1920's, there was scarcely a family that lacked a Victrola and a collection of Victor records. Then, Victor faced a competitive crisis. Radio with its free entertainment, and its uncanny ability to pick up faraway music and speech out of the air gripped the popular imagination. By 1925, many millions of talking machines were gathering dust in attics and cellars.

In the first five years of radio's growth, the Victor organization was unwilling to take seriously this newcomer in the public's affections. However, in 1925, the Victor Company made arrangements with David Sarnoff who was then Executive Vice President of RCA, to supply radio parts to be incorporated in a radio-phonograph combination. This was a significant move.

A year later, the Victor Company launched the biggest campaign of advertising, publicity and sales promotion in its history to herald the recording of discs by electrical methods and the introduction of the Orthophonic Victrola. The tonal quality of this instrument and the improved records were equal to the finest radios of the day. The science of electronics had breathed new life into the phonograph. It was also demonstrated that there is no fundamental competition between the phonograph and radio. Each has its own field. One provides the music of the moment—the other provides "the music you want when you want it".

Within two weeks after the first demonstration of the Orthophonic Victrola by dealers, orders totaling more than 20 million dollars at factory prices had been received in Camden. Business showed a 50 percent increase in the following two years. This was the climax in the history of the Victor Company.

In 1929, the assets of the Victor Talking Machine Company were acquired by the Radio Corporation of America and combined with the selling activities of RCA to form the RCA Victor Corporation. With the acquisition of the Victor Company, RCA obtained large manufacturing plants. By 1935, all the manufacturing, engineering, and sales activ-

ities of RCA, Victor, RCA Photophone and RCA Radiotron were consolidated into the RCA Manufacturing Company, which became the RCA Victor Division of the Radio Corporation of America at the close of 1942.

While these mergers and legal moves may seem confusing, they were all directed toward unifying our activities, and toward obtaining the rights and facilities and resources that would insure the vitality and growth of a great radio organization.

### *Survives Many Tests*

RCA Victor was born during the world's severest economic depression. It underwent many trials, and emerged from each of these tests stronger and surer of its objectives.

Other writers, in this anniversary issue of RADIO AGE, recount the significant milestones in RCA Victor's eventful history, its production and merchandising achievements, in peace and in war. Many changes and many accomplishments have taken place in the 43 years of RCA Victor's existence.

Who can predict what the next quarter century has in store for us? What are the lessons to be learned from the past?

We have seen from the history of the Victor Talking Machine Company that no organization, or industry, however strong and flourishing, can afford to rest on its past accomplishments. We must meet changing conditions if we are to survive. We have seen how technical advances in one branch of radio and electronics can contribute to the progress of the other branches; they are, therefore, inter-dependent. We have seen that from the very beginning one of RCA's principal objectives as a manufacturing organization has been to make progressively better products at progressively lower cost.

We are a large organization with many diverse, yet inter-related, activities. A study of our Company history will demonstrate that the diversification of our activities has many advantages. It has also a number of disadvantages. There is strength in a large family only if each member of that family is also strong, self-reliant and to a large extent self-sufficient. The value of diversification has many times come to the fore, particularly during times of depression. When there is a greatly diminished demand for one product during such times of adversity, a company with diversified products can usually weather the storm, because other products can be pushed harder to make up for the deficiency of the ailing activity. However, in the final analysis, if the organization as a whole is to realize its full potentialities, every element of that organization must be able to stand on its own feet.

RCA Victor has a keen responsibility to the more than 225,000 men and women who have invested their money in our future. We have heavy responsibilities, too, to the other members of the RCA Family; to our country in its war effort, and, when the peace is won, to our commercial customers, upon whose goodwill our peacetime success will depend.

RCA's policy of continuous research and development is solid insurance for our future. Before the war, the RCA Laboratories pioneered many of radio's most important advances. After the war, we may look to these same great scientists to create marvelous new products and services, and to make continuous improvements in the radio and electronic products that are in current use. From them, we will receive additional opportunities for employment, for security, and for growth.

### *Building the Future*

Anyone who has had any extensive experience soon learns that the success of any endeavor, or organization, is entirely dependent upon people. A company is more than a collection of factories, machinery, tools, and money. It is an instrumentality through which thousands of men and women with many talents and skills are gathered together to win for themselves certain essentials to the American way of life. These essentials include the opportunity to earn good wages and salaries, to build security, and to develop opportunities for advancement.

The only way in which a company can provide these essentials is for its men and women to work cooperatively, providing products and services which our customers want, and which they will select over similar products and services offered by competitors.

It is our ambition to make the RCA trademark continue to stand unquestionably for the finest products and services in the radio, sound and electronic fields. And to our workers, the RCA symbol must also represent an organization to which they can contribute their most conscientious efforts and their highest skills, with the knowledge that they are building for their own security and advancement, both as individuals and as a Company.

## NAVY PRESENTS FOLSOM HIGH CIVILIAN AWARD

***Organization and Administration Work in Office of Procurement and Material Praised by Forrestal.***

THE Navy's highest civilian honor was bestowed on Frank M. Folsom, former chief of the Procurement Branch, Office of Procurement and Material, when Secretary James Forrestal presented the Distinguished Civilian Service Award to him for exceptional performance in that capacity from February, 1942, to December, 1943. Mr. Folsom is now a Director and Vice-President of the Radio Corporation of America, in charge of the RCA Victor Division.

In the citation, Secretary Forrestal said:

"By his unusual ability to organize and administer the Procurement Branch of the Office of Procurement and Material, by his adroit skill, leadership and ingenuity in adapting sound business practices to the Navy's wartime procurement problems, and by his devoted attention to duty, Mr. Folsom distinguished himself during this extremely critical period of the Navy's greatest expansion."

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Buy War Bonds

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# RESEARCH OPENS THE WAY

*With the Electron Tube as a Master-key Scientists Explore the Unfathomed Realm of Radio and Blaze Trails that Lead to New Products and Services.*



By Otto S. Schairer

*Vice President in Charge, RCA Laboratories*

RADIO and electronics have achieved unparalleled progress through scientific research during the past twenty-five years. To recount some of the significant advances such as world-wide communications, broadcasting, television, radar, the electron microscope and many other applications of radio-electronics reveals what an outstanding role the men of science have played in the past quarter century.

The master key to their success is the electron tube. It is the center of their accomplishments, and its possibilities for the future are unlimited.

The modern electron tube and its circuits have long since rendered obsolete all other radio transmitting and receiving equipment. They made possible the efficient and reliable facilities by which the United States now communicates directly and instantaneously by radio with all of the principal countries of the world. But this was not accomlished without much additional research pertaining to every part of the system.

International radio communications began with long waves and high power transmitters. Large antennas on lofty towers were required. But few transmission channels were available for overseas service. Sending speeds were slow and inadequate. Research on the propagation of radio waves brought about the discovery of short waves and electron tubes were developed to harness them for practical service.

### *Radio Spectrum Enlarged*

Success in these developments greatly expanded the amount of radio spectrum and the number of transmission channels useful for international communications and increased the efficiency of overseas radio circuits. As a result transmission now requires only one-tenth or less of the power formerly used. Research has continued to increase the intelligence-carrying capacity of the short-wave spectrum. It is now four to six times greater per channel than that of long waves. There are indications that a further six- to ten-fold increase is possible.

Research produced the RCA system of diversity reception which greatly improved the stability and reliability of short-wave communication. Directive antennas of moderate dimensions concentrate the radiated energy and beam it to the distant receiver with greatly reduced loss. Advances in terminal equipment have speeded communication services and made them more economical and dependable.

Marine transportation and navigation are today given vital direction and protection by radio services. They include telegraphy, telephone, direction finding, guides to and from ports, emergency alarm apparatus, lifeboat sets, and other devices and services, all of which have involved vast amounts of research and development.

Research has added immeasurably to the progress and safety of aviation. Electronics, ultra-high frequencies and aeronautics have a natural affinity. They are inseparable in aeronautical communication and navigation systems. Instrument landing methods, collision prevention apparatus, clearance and height measuring instruments, ground-speed indicators, and other

RCA LABORATORIES, PRINCETON, N. J., CENTER OF RADIO-ELECTRONIC RESEARCH.



instruments guided planes safely through bad weather.

The electron tube and its circuits made radio telephony practicable. They simplified and made more efficient both the radiotelephone transmitter and the receiver. Out of this came radio broadcasting, which is the greatest system of mass communication ever developed by man. Continuous and intensive research and development have greatly improved receivers and have so lowered their costs that they are within the reach of every pocketbook. Home receivers are operated from electric light circuits. Battery operated receivers are now used only where electric light service is not available, or where portability is required as in pocket and "personal" receivers. Modern receivers embody such advances as tubes operating on alternating current, circuits adapted for either alternating or direct current operation, screen-grid tubes which reduce radiation, multi-function tubes such as pentodes, hum reduction devices, push-button tuning, magic-eye tuning indicators, and many others. All of these improvements in receivers have contributed much to the phenomenal growth of the radio industry in the past quarter century. In 1941, 12,000,000 receivers were sold in this country and nearly 60,000,000 were then in use.

There are approximately 1,000 broadcasting stations in the United States. They have been connected into networks to provide both national and world-wide broadcasting. International broadcasting has also been provided by means of transoceanic radio circuits which deliver foreign programs to our domestic networks and our domestic programs to foreign networks. Direct international broadcasting is also conducted by means of short waves beamed to the recipient countries.

Radio and electronic research have revolutionized and modernized sound recording and reproducing for both the home and the theatre. Modern phonograph records are recorded electronically and are incomparably superior to those previously recorded mechanically. The reproductions from these records by modern radio-phonographs are also effected electronically with greatly improved realism and beauty.

Electronically recorded and reproduced sound added to motion pictures has made the silent film completely obsolete and has remade and revitalized the motion picture industry. All motion picture studios and theatres are equipped with sound recorders and reproducers which have been highly perfected by research and development.

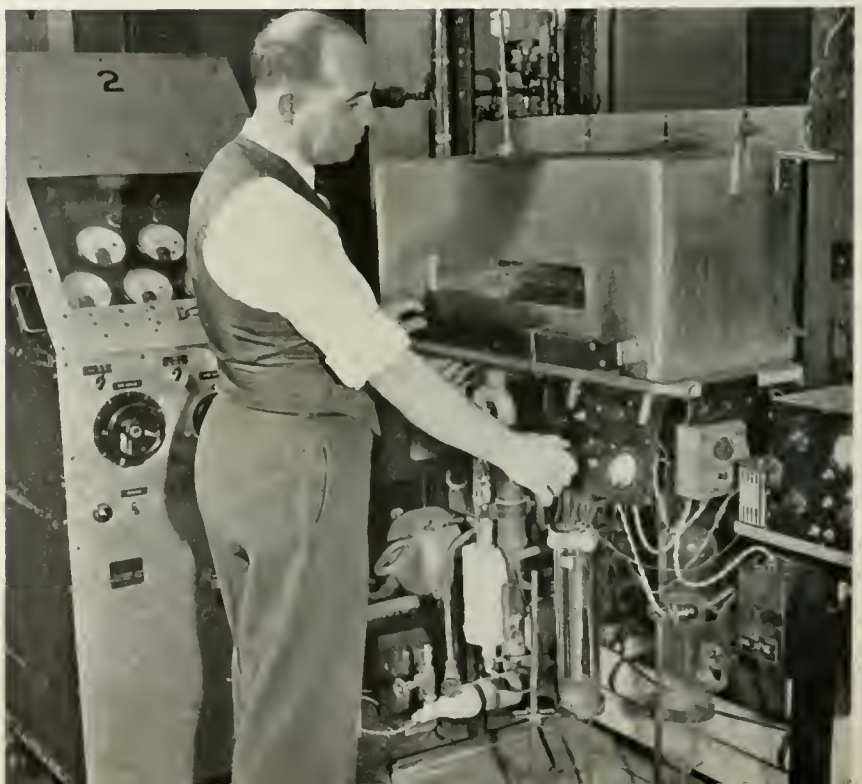
### *New Services Coming*

Continuous research has revealed the utility of the very short radio waves — those in the very-high, ultra-high and super-high frequency ranges of the radio spectrum. It is making available for practical application vast unused portions of the radio frequency spectrum which have potentialities far greater than all radio services of the past.

In general these high frequencies have the characteristic of "short distance" or "line of sight" transmission. The range depends largely on the height of the transmitting and receiving antennas. They are also almost entirely free of atmospheric static, and they have greater inherent stability in the space circuit than other frequencies. Being especially useful for relatively short range and local uses, they make many new services possible. The use of a given band of these frequencies can be repeated many times in this country without interference between stations. They are eminently favorable for use in new services which require the transmission of very large amounts of information in very short intervals. In short, they open a new epoch in domestic and other short-range communication services.

Among them are high frequency broadcasting, or "FM", which provides substantially improved tonal quality in broadcast reception and makes many more broadcasting stations possible. FM broadcasting is destined to expand rapidly. Postwar broadcast receivers will generally be provided with wave bands for receiving programs from the many FM stations which will dot the country. Research has produced many other important applications of frequency modulation in communication and signaling services.

Undoubtedly the most advanced contribution that research has made to the progress of radio during the past 25 years is electronic television. Its potential value and importance to the public and to the radio industry are incalculable. It, too, makes use of the newly opened por-




SCIENTIFIC DEVELOPMENT OF MANY DIFFERENT TYPES OF ELECTRON TUBES IS ONE OF THE MAJOR ACTIVITIES AT RCA LABORATORIES. HERE, AN EXPERIMENTAL TUBE IS BEING AIR-EXHAUSTED UNDER CAREFULLY CONTROLLED CONDITIONS.

tions of the radio spectrum, but television research has extended into many other fields. It has produced many advances in electron and cathode-ray tubes. Among them are the Kinescope by which the received picture is displayed, and the Iconoscope and Orthicon tubes which are used in television cameras. Many other new features have been developed in circuits and accessories to enable these essential tubes to function effectively. Not the least of them are advances in fluorescent materials which have found many other valuable applications, as in lighting.

Television is ready to render another mass communication service of excellent quality. It will serve both the home and the theatre and will employ many thousands of workers in factories, stores, shops and studios.

Television broadcasting stations will require networks for connecting them into national systems similar to present sound broadcasting systems. Ordinary wires cannot be used for this purpose. Fortunately, research has made available both coaxial cables and radio relays which can be used for linking television broadcasting stations. Radio relays operate on the extremely high frequencies of the new radio spectrum. They will utilize a single frequency throughout the circuit, will be provided with highly directive transmitting and receiving antennas, and will require a power output of only a few watts. Unattended relay stations will be located at intervals of about thirty miles.

Radio relays will provide the wide transmission channels required, not only for television, but also for high speed facsimile and other modern services. They can be utilized in aircraft communication, navigation and control services. They can serve as terminal stations for connecting mobile craft of all kinds with telephone or other lines of communication.

### *Radio Facsimile Advances*

Still another service possessing large possibilities, but yet in its infancy, is the transmission and reception of facsimile copies of writings and pictures. The daily papers are illustrated by reproductions of photographs taken on the other sides of the oceans but a matter of hours or minutes before they appear on the news stands. These are transmitted by radio facsimile equipment. Facsimile broadcast receivers and facsimile duplicators for use in offices, factories, and business establishments represent only some of the possibilities of this product of research.

Research has found many valuable applications for electron tubes and their circuits in industrial processes. Chief among them is radio frequency heating which is used for seasoning, drying, gluing, welding, soldering, riveting and tempering a wide variety of materials.

While all of these advances have been great contributions to our peacetime economy and welfare, by far the most significant achievement of this quarter century of advanced research is the groundwork which it laid for instant service in time of national peril. When this story can be told, it will be a glorious chapter in the history of science and will prove beyond peradventure of doubt that continuous and persistent research is essential both to the preservation and to the prosperity of our Nation.

## Paris Circuit Reopens

DIRECT radiotelegraph communication between New York and Paris, suspended since June, 1940, by German occupation of the French capital, was re-established on September 16 by R.C.A. Communications, Inc.

For the present, the New York-Paris circuit is carrying only Government and press messages; no commercial traffic can be accepted. Movement of press dispatches from the war fronts in France and Germany was greatly facilitated.

The Paris circuit is one of the United States' oldest radio communication links, having been opened in December, 1920. After the Germans took over Paris, direct radiotelegraph service with France was maintained through Bordeaux and Roanne. This service was discontinued when the United States broke off relations with the Vichy government.

Paris is the second great European capital with which RCA has re-established direct radio communication. The circuit between New York and Rome was re-opened on June 13.



A DEVELOPMENTAL ULTRA-HIGH FREQUENCY TUBE IS TESTED BY RESEARCH SCIENTISTS IN AN ALL-COPPER SHIELDED ROOM AT RCA LABORATORIES.

# RADIO ON THE HIGH SEAS

*The Electron Tube Has Brought Great Changes in Maritime Radio, Replacing Old Spark Transmitters and Greatly Increasing Efficiency of Communications.*



By Charles J. Pannill

*President,*
*Radiomarine Corporation of America*

RADIO as applied in the maritime field may rightfully be considered as the pioneer of the vast radio industry as we know it today. While the general public is more familiar with radio as a source of entertainment and information, maritime radio was "rocked on the cradle of the deep" long before Marconi was able to transmit his first signals across the Atlantic.

The first twenty years of radio development, or until the formation of RCA in 1919, may be termed the "Spark Age". Transmission was largely by means of spark sets, while reception depended upon crystals such as were used in the earliest simple types of broadcast receivers. The quarter century, from 1919 to 1944, may be considered as the "Vacuum Tube Age", and it is within this period that Radiomarine Corporation and its predecessor companies have pressed steadily forward in developing new devices and services for the Merchant Marine.

How far marine radio has progressed may be seen in the fact that emergency and distress calls, once the primary purpose of radio communication at sea, now form but a small part of a service that is many-sided and world-wide in scope.

Vacuum tube transmitters for shipboard service and for use in coastal stations began to be available in practicable and rugged designs about 1921. Since the majority of merchant vessels at this time were already equipped with spark types of transmitters, which were made and installed during World War I, it was desirable to make the transition from spark to vacuum tube with a minimum of expense. This led to the development of the so-called converted spark sets in which high-power vacuum tubes and their associated oscillating circuits were substituted for the spark gaps in the radio transmitters. In addition, vacuum tube radio receivers were installed, all of which greatly increased the range of communication and the safety of life and property.

### *Change to Short Waves*

The early vacuum tube transmitters and receivers were designed to operate in the low and intermediate frequency bands from 100 to 500 kilocycles. Although very efficient when used over sea water, they have fundamental limitations when distances of several thousand miles must be covered. This led to the development, by Radiomarine, of short wave apparatus so as to permit transmission and reception on frequencies between 2,000 and 18,000 kilocycles for long range communication.

Beginning in 1925, Radiomarine introduced the first modern shipboard direction finders employing superheterodyne circuits and automatic mechanisms for correcting deviations in radio bearings. These developments led to widespread application of marine direction finders which not only enabled vessels to avoid hazards during unfavorable weather conditions, but also permitted the maintenance of schedules so that ships were not delayed during thick weather.

### *System Is Extended*

As the number of shipboard radio installations expanded and with the increased traffic to be handled between ship and shore, Radiomarine extended its system of coastal stations on the Atlantic, Pacific and Gulf Coasts. A powerful station on Cape Cod, Massachusetts, and a similar station near San Francisco were used to handle large volumes of radio traffic with all classes of passenger and cargo ships. In addition, ten other stations along the Coasts and on the Great Lakes were maintained to provide both local and long distance communication as required at the principal ports in the United States.

With the passage of the Communications Act of 1934, and the ratification of the International Convention for the Safety of Life at Sea in 1936, several new devel-

IN THE DAYS BEFORE THE ELECTRON TUBE WAS HIGHLY DEVELOPED, THIS RADIO ROOM ABOARD THE SS ADRIATIC WAS A MODEL IN MARINE COMMUNICATIONS.







ONE OF THE FINEST SHIPBOARD RADIO INSTALLATIONS EVER CREATED WAS DESIGNED, BUILT, AND INSTALLED ON THE FORMER SS AMERICA BY RADIOMARINE CORPORATION OF AMERICA. LEFT: RADIO DIRECTION FINDER IN THE "WHEEL HOUSE." ABOVE: THE SHIP'S MAIN RADIO OPERATIONS ROOM.

opments were made by Radiomarine to enable ship owners to comply with the new regulations. A new crystal-controlled 200-watt intermediate frequency transmitter was designed and installed on hundreds of vessels to provide the most modern transmitting facilities. In addition, the equipment was arranged to operate, in an emergency, from storage batteries so that a vessel in distress would not have to depend upon power from the engine room in order to carry on radio communication.

Another important development comprised a complete radio transmitter and receiver installation for use in the lifeboats of passenger ships, as required by law. Still another development was an improved high frequency transmitter of 200-watt rating with both crystal and master oscillator frequency control to provide communication over distances of 3,000 or more miles.

The same leadership was also demonstrated in the field of radiotelephone communication for small vessels. Such equipment which, by the nature of its service, must be used by non-technical personnel, permits the yacht owner, the tugboat captain, and others on all types of small craft to enjoy complete two-way communication with the land line telephone system, as well as to communicate from boat-to-boat.

The automatic distress alarm has proved to be a valuable device in summoning aid at sea. This equipment, which is turned on in the radio room at all times when the radio operator is not on duty, is designed to actuate alarm bells upon receipt of the international auto alarm distress signal. In 1937, Radiomarine began installations of the first all-electronic type of auto alarm, and up to the present time approximately 3,000 vessels have been equipped with this device.

### *Special Unit Built*

In the field of large passenger vessels, which require the most complete type of radio installation, Radiomarine in 1940 made available custom built equipment for the 35,000 ton *S.S. America*. This installation comprised three independent 1-K.W. transmitters for low, intermediate and high frequency service, as well as a 600-watt, high frequency, radiotelephone transmitter. For reception and for control of the various transmitters, a special operating console was designed. The *America* installation also included a separate emergency transmitter, receiver and auto alarm, a 75-watt radiotelephone for use by the navigating personnel, and a modern direction finder for taking radio bearings directly from the wheelhouse of the vessel.

With the impact of war in 1941, Radiomarine was in a position to devote and expand its entire facilities to the production of radio equipment for both military and commercial types of vessels. The long range construction program of the Maritime Commission, begun in 1936, had resulted in the development of standard radio installations for the various types of "C" class ships, and also for tanker vessels. Several of the small radiotelephone units originally developed for private craft were quickly redesigned to meet the requirements of the U. S. Navy. Large quantities were built for all types of auxiliary craft. New models of direction finders were placed into production, some types being designed for Maritime Commission vessels and other types for military applications.

### *"Package" Installation*

When the large scale program for building more than 2,600 Liberty ships was undertaken, Radiomarine produced a complete radio installation in a single "package", designed to be installed in a minimum of time and with standard wiring so that any shipyard could readily install and connect the unit.

In the latter part of 1943, when the Maritime Commission designed the new Victory ship, Radiomarine developed the first combination intermediate and high frequency installation of the console type.

### *Design Lifeboat Equipment*

Lifeboat radio equipment was designed primarily for applications on passenger vessels. Such equipment, being powered from storage batteries, was not suitable for the smaller type of lifeboats utilized by large numbers of cargo and tanker vessels. Accordingly, in 1940 and well in advance of subsequent new Government regulations requiring cargo vessel lifeboat radio equipment, Radiomarine developed a compact combination radiotelephone and radiotelegraph transmitter-receiver unit, all powered from a hand driven generator. This apparatus has been of inestimable value in saving lives at sea, and, because it includes facilities for telephone communication, can be used by any member of the crew without requiring knowledge of the telegraph code. More recently, Radiomarine has designed a new compact binnacle type of lifeboat radio, which includes not only telephone and automatic telegraph features, but also provides long distance communication on a high frequency. This development removes the limitation of distance range on the standard 500 K.C. distress frequency and also enables radio bearings to be taken to locate the lifeboats over great distances.



LONG BEFORE PEARL HARBOR, RADIOMARINE BEGAN TO EXPAND ITS PRODUCTION LINES TO MEET THE NEEDS FOR RADIO EQUIPMENT OF THE MERCHANT MARINE AND OTHER GOVERNMENT SHIPPING.

### *Maintains Wide Service*

In safeguarding vessels from submarine attack, when "radio silence" is maintained by ships, it is necessary to prevent any signals from leaking out from the oscillating tubes in radio receivers. Radiomarine developed a special intermediate and high frequency receiver to meet these rigid requirements.

To maintain its farflung service, Radiomarine, in addition to its main office in New York City, has twenty-one branch offices located in the principal ports of the United States. In addition, Radiomarine has affiliates where service is maintained in the principal foreign ports throughout the world. Complete service facilities to maintain or repair shipboard radio installations are highly essential during war or peace if vessels are to maintain their schedules and to safeguard the movement of the vessels while at sea.

### *Win Production Awards*

The outstanding performance of Radiomarine during the War has been recognized by the U. S. Government. On October 8, 1942, Radiomarine was awarded the Army-Navy "E" Pennant for high achievement in the production of war material. On March 8, 1943, the Company received the Maritime "M" Pennant and Victory Fleet Flag from the U. S. Maritime Commission for outstanding production. The third gold star to be added to the Maritime "M" Pennant for continued production efficiency was awarded August 16, 1944. A third star for the Army-Navy Flag was awarded to Radiomarine on September 6, 1944.

In closing, I desire to pay special tribute to the Engineering and Production staffs of Radiomarine for developing and producing the various models mentioned herein. They have done a splendid job, and to them goes much of the credit for our success.

## RCA VICTOR OUTLINES POLICY FOR VETERANS

*Beneficial Arrangements Made for Re-employing Service Men Returning from War to Work.*

A COMPREHENSIVE policy for the re-employment of war veterans—women as well as men—has been announced by the RCA Victor Division, Radio Corporation of America, which has approximately 6,000 former employees serving in the armed forces.

According to Forrest H. Kirkpatrick, the company's Personnel Administration Director, policy includes beneficial arrangements that go well beyond the broad federal laws enacted to protect service men's re-employment status. It outlines specific provisions for extensive retraining and upgrading programs, recognition of seniority rights, insurance privileges, rehabilitation programs, and vacation allowances.

Unique in the training program provisions is a "protection of rights" clause for returning veterans who desire and obtain company approval to take special training offered by the Government before returning to the company. The policy provides that any veteran who indicates, within forty days of his discharge from military service, his intention to return to RCA after a period of such training may be granted a "leave of absence" up to one year. In some instances this period may be extended beyond the year by mutual agreement of the company and the veteran.

Special consideration will be given handicapped service men, according to RCA's policy. "Former employees who have disabilities resulting from service in the armed forces," it declares, "should have opportunities for work and proper job placement. When a disability makes it inappropriate for a former employee to resume his old job or a comparable one, efforts will be made to place him in the highest paying available job for which he is qualified."

Buy War Bonds

# SOCIAL ASPECTS OF RADIO

*Broadcasting of Entertainment, News and Education as a Service to the Public Performs an Economic Mission Which Has Genuine Social Significance.*



By Frank E. Mullen

*Vice-President & General Manager, National Broadcasting Company, Inc.*

BROADCASTING is so young an art that it is still too early to appraise its social effects with any degree of finality.

In considering the results of sound broadcasting, a few examples of accomplishments and trends during its quarter-century of progress will serve as at least a partial indication of its far-reaching social influence.

At the present time, the outstanding service of broadcasting is the role it plays in connection with the war. When the National Broadcasting Company was formed in 1926, there were no news programs. Prior to the Munich crisis in 1938, news was still a relatively minor item on the broadcasting schedules of the networks. But today, approximately 20 per cent of NBC's total network program hours are devoted to news reports and news commentary. The public has learned to get its news first from radio. In view of the profound significance of international affairs in the postwar world, it is likely that the broadcasting industry will continue to maintain complete world news coverage and retain its present position of news leadership.

Approximately an equal amount of time on the NBC network is occupied with programs designed for the purpose of furthering the war effort and building morale on the home front. During 1943, NBC devoted an average of more than ninety-three network program hours a month, or three hours a day, to such programs. During the first seven months of 1944, this average has been increased to 118 a month, or nearly four hours a day.

Outstanding among NBC's war effort programs is the Army Hour. It has been on the air over NBC every Sunday afternoon since April, 1942, and has built up a regular listening audience of many millions. The Army Hour program is written by the Radio Branch of the Public Relations Bureau of the War Department, and is produced jointly by the Army and NBC.

Other important war effort programs have enlisted nurses, nurse's aides, home-nursing students and blood donors for the Red Cross. Housewives have been furnished important information to aid them in the conservation of foods and materials. Besides the Army, the work of the Navy, Marine Corps, Coast Guard and Army Air Corps has been described and explained to the American public in many NBC programs.

Broadcasting started in an election year, 1920—which, by coincidence, happened to be the first year that women had the right to vote in a national election. On Election Night of that year, the late Dr. Frank Conrad broadcast the returns of the Harding-Cox presidential election, from Station KDKA in Pittsburgh. Historically, therefore, November 2, 1920, is considered the birthdate of public broadcasting.

In every Presidential election since that year, broadcasting has played a part of increasing importance, and in each election the total popular vote has broken all previous records.

Complete coverage of the Republican and Democratic National Party conventions has been furnished by NBC in each Presidential Election year since the company was founded. It is NBC's policy not to sell time to any political organization prior to the close of the party conventions. Our convention broadcasts are entirely on the basis of an unsponsored, impartial public service, and we have to cancel many hours of profitable commercial business in order to put the convention programs on the air.

In the entertainment field, prob-

ONE OF BROADCASTING'S OUTSTANDING CONTRIBUTIONS TO THE WAR EFFORT IS THE "ARMY HOUR," BROADCAST BY NBC. IN THE SCENE BELOW, A "PICKUP" IS MADE FROM THE FIRING RANGE AT FORT BENNING, GA.





WEBER AND FIELDS, FAMED COMICS, PARTICIPATED IN NBC'S FIRST BROADCAST ON NOVEMBER 15, 1926.

ably the most important social contribution of broadcasting has been to increase the public appreciation of good music. NBC has a notable tradition in this respect. The inaugural program of NBC on November 15, 1926, from the Ballroom of the Waldorf-Astoria Hotel, featured a symphony orchestra under the direction of Dr. Walter Damrosch. Dr. Damrosch's Music Appreciation Hour later became an outstanding example of the power of radio in the fields of both music and education, and was heard weekly by millions of school children throughout the United States. On January 21, 1927, Grand Opera was broadcast for the first time to a nationwide audience, when NBC broadcast the garden scene from "Faust" from the stage of the Chicago Civic Auditorium. On December 25, 1931, occurred the first network broadcast of a complete opera, when NBC inaugurated the famous Metropolitan Opera Saturday afternoon series with "Hansel and Gretel" from the Metropolitan Opera House in New York.

The first symphony orchestra ever created exclusively for radio was organized by NBC in 1937, and the illustrious Maestro Arturo Toscanini was engaged to head and conduct it. Under his brilliant leadership, the NBC Symphony Concerts became the outstanding musical event in radio. In addition to Maestro Toscanini, the NBC Symphony Orchestra has been conducted by many other distinguished guest conductors. In 1943, General Motors Corporation assumed the sponsorship of these programs and, by maintaining the same high standards of leadership and performance which made them famous, is rendering a service of the utmost importance to the American people.

Lighter music, of course, is always popular on the network. Aside from its entertainment value, popular music heard over the radio has educated many listeners progressively toward an appreciation of the more serious composers.

During 1943, 46 per cent of NBC's total network program hours were sold to national advertisers. The balance, 54 per cent, were devoted to non-commercial programs for which NBC and its affiliated stations furnished time and facilities and received no remuneration. Great efforts are taken by the NBC management to maintain a balanced program structure.

### *Public Service Grows*

In 1937, NBC was fortunate to enlist the services of Dr. James Rowland Angell, President Emeritus of Yale University, as the company's Public Service Counsellor. Under his able direction, the public service program schedules of NBC have grown in scope and effectiveness and have enlisted the active interest not only of millions of listeners, but of numerous educational, cultural, philanthropic and Governmental organizations. The NBC Inter-American University of the Air presents an integrated schedule of educational programs which are now "assigned listening" in more than a hundred colleges and universities throughout the United States.

No reference to the history and progress of NBC programs would be complete without mentioning the company's Code of Program Policies which has governed the preparation and supervision of NBC programs for the past ten years. Standards of fairness and good taste in the handling of program material of all kinds are laid down in the NBC Code, together with principles and practices relating to commercial announcements. The Code has not only served as a guide for the NBC program and sales staff, but as a model for the entire broadcasting industry.

While it is natural to consider programs responsible for the social impact of radio, broadcasting also performs an economic mission which has genuine social significance. It has become a vital arm of distribution of American products and services. As such, radio is responsible for the employment of far more men and women in the factories, stores and offices of our national advertisers than the estimated 400,000 who are employed directly in the radio field itself.

We are on the threshold of vast changes in the technical development of broadcasting. The social impact of television, when radio becomes a seeing-eye as well as a listening-ear, challenges the imagination.

Television, with its great power of visual demonstration, as against the power of exposition through sound alone, will vastly further all educational processes.

And as a great new medium for the distribution of products through advertising, the advent of television will be another economic milestone of vital importance.







LEFT: WOUNDED WAR VETERANS SEE TOPNOTCH TELEVISION PROGRAMS AS THEY CONVALESCE IN NEW YORK HOSPITALS. CENTER: ONE OF RADIO'S GREATEST PROGRAMS IS THE NBC SYMPHONY, UNDER THE BATON OF MAESTRO ARTURO TOSCANINI. RIGHT: ROBERT ST. JOHN ON THE AIR WITH A NEWS FLASH ON D-DAY.

# ADVANCES IN TELEVISION

*Zworykin and Morton See Television About to take Its Rightful Place in the Entertainment Field—They Trace Historic Milestones Which Put Television on the Threshold of the home.*

By V. K. Zworykin and G. A. Morton
*RCA Laboratories*

THE past quarter of a century has seen television develop from a hobby, indulged in by a few of the more adventurous experimentalists, into a system which is about to take its rightful place in the entertainment field. The picture has changed from a faint flickering image, which could scarcely be dignified by the name of picture, to a clean steady black and white reproduction equal in quality to a 16 mm. motion picture.

The greatest single factor making possible this advance was the introduction of electronic equipment to take the place of the earlier mechanical devices. It is in this phase of the development that RCA has contributed more than any other organization in the country.

As early as 1919, a system based entirely on electronic devices was recognized as a possible solution to the enormously complicated problem of television.

Looking back at the situation in 1919, a very fundamental obstacle which stood in the way of building any kind of a television system producing pictures with the definition necessary for real entertainment value was the lack of amplifier tubes capable of handling the required frequency band width. The frequency band needed to transmit the video signal of a 525-line picture is at least 4½ megacycles. The development of amplifier tubes by RCA to achieve this is one of the most brilliant stories in radio history. Without this engineering feat, television as known today would not be possible.

Related to the development of amplifier tubes is the problem of power transmitting tubes capable of operating at frequencies suitable for television transmission. In 1919, this problem had scarcely been considered. By the early 1920's, the development of the high-frequency transmitting tubes had begun and from then until now power tubes operating in the 100-megacycle region continued to be improved until they are now adequate for covering the 40- or 50-mile service radius permitted by these frequencies.

### *Obstacles Overcome*

In tracing the history of television during the past twenty-five years it will be seen that the lack of amplifiers, transmitters and other circuit components was not, however, the outstanding obstacle in the development of the field. Actually, the most difficult problem which had to be overcome was that of suitable devices for converting the light image of the scene being televised into an electrical signal, and reconverting the electrical signal back into a television picture.

Electronic devices for these purposes had been proposed longer than twenty-five years ago; for example, Boris Rosing's cathode-ray receiving tube in 1907 and Campbell Swinton's electronic pick-up tube in 1911.

In 1923, a major obstacle was overcome with the introduction of the storage principle as embodied in the Iconoscope. This offered the possibility of a theoretical increase in sensitivity of nearly 400,000 times, and brought television into the realm of practicability.

Of course, the actual working out of the Iconoscope from its initial form into the present practical tube took many years. This has been almost exclusively an RCA development.

In 1939 a new type of Iconoscope, the Orthicon, was introduced by RCA. It employed a low-velocity scanning beam which overcame both the inefficiency of storage and the spurious shading signal.

Early in the 1920's, serious work had begun on electronic tubes for reproducing television pictures. The principle upon which these tubes are based is that of allowing a sharply defined narrow cathode-ray beam to strike a screen of fluorescent material which becomes brilliantly luminous at the point of impact of the electrons. By deflecting the beam back and forth across the screen in a series of straight parallel lines a scanning pattern can be formed, corresponding to that of the pick-up device. The intensity of the light at every point of the screen is controlled by modulating the electron current in the cathode-ray beam with a suitable control grid.

From almost the start of this period, it was apparent to most of those working in the field that eventual solution to the problem lay in the cathode-ray tube. However, as with the pick-up tubes, a long period of development lay ahead before the cathode-ray receiving tube could be considered practical for a home television receiver.

The Kinescope, also an RCA development, was such a tube. In it coaxial cylinders, together with suitable circular apertures, form the electrostatic electron lens sys-

DR. V. K. ZWORYKIN, ASSOCIATE RESEARCH DIRECTOR, RCA LABORATORIES, EXHIBITS AN ICONOSCOPE, "EYE" OF THE TELEVISION CAMERA.





ABOVE: TELEVISION CAMERAS PICK UP THE SCENES OF A DRAMATIC PRODUCTION IN NBC'S RADIO CITY STUDIOS. LEFT: FROM THIS CONTROL ROOM, PROGRAM DIRECTORS SUPERVISE THE PRODUCTION.

tem which produces and modulates the fine cathode-ray beam. The beam is made to sweep out the scanning pattern by deflecting it with magnetic fields produced by properly shaped deflecting coils through which current having a sawtooth wave shape flowed. Other types of Kinescopes employed electrostatic deflecting plates to move the beam. Since the Kinescope was first developed, the electron gun has been improved steadily so as to operate at higher voltages, deliver more current, have better control characteristics and give a smaller spot.

The first cathode-ray tubes used natural Willemite for their screens as it, among the then available phosphors, appeared to have the most suitable characteristics for television work. These screens gave black on green pictures which left a great deal to be desired both in color and intensity. Furthermore, the material was not very stable and the screens were expensive to make. As part of the RCA television research program, a laboratory designed and equipped especially for the purpose was set up to study the problem of phosphors. The results obtained have been very gratifying. It has been possible to develop phosphors which give a black and white picture, have more than five times the efficiency of the earlier screens and which are both stable under intense beams of high-voltage electrons and economical to produce.

### *Tube Image Projected*

Up to the outbreak of the war all commercial home receivers used direct-vision viewing tubes, that is Kinescopes or cathode-ray tubes with the picture viewed directly on the screen end of the tube. This imposed a practical limitation to the size of the picture that could be obtained, because of the physical size of the tube. The larger home receivers employed a twelve-inch Kinescope which gave a fairly satisfactory picture size, but made it necessary for the audience to sit quite close to the set if they wished to see all the information conveyed by the picture. However, for a number of years before the war, active work had been in progress in developing a small tube giving a very bright picture which could be projected through a suitable lens system onto a large viewing screen. These projection Kinescopes were based on the same principles as the direct-viewing tubes, but employed guns, operating at higher voltages, which delivered a much more intense beam to the fluorescent screen. The screens of course had to be processed in such a way as to be stable under these operating conditions. By 1937 it was possible to demonstrate a projected picture on an 8 x 10-foot screen, which could be viewed without undue fatigue in a well darkened room, although the picture brightness was not all that might be desired.

The next big step forward was the substituting of a Schmidt optical system for the more conventional lens. Essentially, this system consists of a spherical mirror which reflects the light from the projection Kinescope onto a viewing screen, an aspherical lens element being placed at the aperture of the mirror to correct the aberrations of the system. Such an optical system makes possible many times more efficient utilization of the light from the Kinescope and brings projection television well into the realm of the practical. Both projection home and theatre television receivers have been demonstrated and the results are so outstanding that the future of this type of instrument is unquestionably assured.

During the development of the cathode-ray terminal tubes described above, similar progress had been made in the circuit components which are, of course, just as essential to television in its final form as the Iconoscope and Kinescope. Keeping pace with the new amplifier tubes, better amplifier circuits were developed having improved signal-to-noise ratios, flatter frequency responses and greater stabilities. Synchronizing circuits and deflection generators have been simplified and made more reliable. The high-voltage power supplies required in the home receiver have been made more practical. In other words, the whole system has been integrated into a practical unit.

Throughout this period of development, improvement in manufacturing and production methods have more than kept pace so that, in spite of the fact that the present day television sets are incompa-



HIGH ON THE TABLE OF PROGRAM FARE IN TELEVISION IS SPORTS, BOTH INDOORS AND OUT. HERE, NBC'S CAMERAS SCAN A MAJOR LEAGUE BASEBALL GAME.

rably higher than the earlier models, their cost in terms of man hours is actually less.

An historical summary such as this would not be complete without at least a brief mention of the improvements which have been made in programming and studio technique. Early workers were satisfied if the picture of some simple object, for instance the head and shoulders of a model, could be successfully transmitted. This was extended to include larger and larger groups, until the studio of today resembles that for making moving pictures, with provision for staging complete plays, concerts and other interesting material. The lighting is arranged for maximum flexibility, several cameras mounted on special dollies are provided so that the pick-up can be switched from one to another as the action demands, while special boom microphones receive the sound from the desired point without interfering with the picture. The picture is monitored from a control room so arranged that it overlooks the studio, making it possible to completely coordinate the sequence of the program.

Television transmission from moving picture films has also been developed to a very high level, and experience has shown that films either alone or in combination with stage productions provide excellent program material.

Current event programs have also proved very successful. A portable pick-up unit and transmitter forms part of the National Broadcasting Company's television equipment in New York.

Research and development over the past twenty-five years, representing several million man hours of hard, honest work and thought have brought television to a point where its entertainment value is comparable with that of the moving picture. Engineering field studies and field tests have defined service areas of transmitters, proved the feasibility of chaining stations by cable and radio relay links, and paved the way for practical telecasting. Professional entertainers, artists, stage managers and directors have studied and tested the various phases of program production. Thus, the engineering and operational framework of a complete system has been completed. In other words, television is now ready for the public.

The question of the future technical developments of television is one of great interest to the engineer. Perhaps the foremost question is: What about color television? Color is definitely in the experimental stage. It has been successfully demonstrated under carefully controlled conditions, but is far from ready for general use. This applies both to pick-up and receiving equipment. Before color attains the widespread applicability required by television broadcasting, much time and effort must be expended in its development.

Continued developments and improvements in black and white television are inevitable. Advances in the pick-up tube and its associated equipment will enable the transmission of pictures under conditions which are now impossible. Some of the principles required for these new devices are already known, some remain to be discovered. Further work on the Kinescope, particularly of the projection type, will make possible larger and brighter pictures.

The continued investigation of circuit problems, of the requirements for high definition and of most agreeable contrast relations will make it possible to greatly improve the quality of the picture within the limits of the present television transmission standards. All this will take time and great effort but its accomplishment is certain.

What lies in the future for commercial television can only be conjectured. To those who have worked in the television field the universal acceptance of this new means of communication and entertainment seems inevitable. It will bring a visual representation of plays, stories and events which can now only be heard by radio. Furthermore, to the casual listener to whom the radio is serving as an incidental background to some other activity, it provides a window through which he can glance to see who is performing. In other words, the radio audience will no longer be "blind".

ARTIST'S CONCEPTION OF HOW A HOME TELEVISION RECEIVER WILL FIT INTO THE FAMILY SCENE WHEN THIS NEW SERVICE IS EXPANDED AFTER THE WAR.



# THE "KNOW-HOW" IN RADIO

*Shannon Tells How Experienced Engineering Talent and Products Provide an All-Important "Arsenal" in Supplying the Armed Services.*



By Robert Shannon

*General Manager,*
*RCA Victor Division*

RCA's manufacturing experience dates back fifteen years, when the assets and facilities of the Victor Talking Machine Company were consolidated with the selling and merchandising organization of RCA into what is now known as the RCA Victor Division. This event came a full decade after the formation of the Radio Corporation of America.

Prior to the acquisition of the Victor Company's manufacturing facilities, and later of a number of radio tube plants from the General Electric and Westinghouse companies, RCA was completely dependent for its production of radio equipment upon the two big electric companies. As the home radio business became more competitive, this arrangement proved so cumbersome, so slow, and so costly that RCA was at a great disadvantage in the commercial markets.

On December 26, 1929, the RCA Victor Corporation was organized. Its corporate purposes were defined, generally, as: to manufacture and sell radio, sound recording and reproducing apparatus, records, etc., and the taking over of the assets of the Victor Talking Machine Company, together with the manufacturing and sales rights of RCA, Victor, RCA Photophone, and various other corporations. Thus the way was opened for the fulfillment of a dream which David Sarnoff, then Executive Vice President, had long entertained.

Starting literally from scratch, and in the early stages of the world's most severe economic depression, RCA Victor had to build a new manufacturing and engineering organization as well as an expanding sales organization. As the depression became more severe, for the first time in the new industry's history, radio sales fell off sharply, and RCA Victor found itself with what were then considered enormous plant facilities. Some painful compression and streamlining had to follow.

### *Plant Facilities Expand*

There was a hard road ahead for the new organization—of learning how to build better products, at less cost, in order to be more competitive in each of the fields in which we operated. But, as economic conditions improved, RCA Victor's fortunes also improved. Reviving markets, coupled with a growing proficiency in the manufacture of equipment for each of our fields, soon indicated that far from having the headache of an excess of manufacturing facilities, RCA Victor would have to prepare additional facilities.

RCA Victor's first important expansion of manufacturing facilities took place in 1937, when our idle plant in Indianapolis was opened and expanded. Here was centralized the manufacture of all types of sound apparatus and associated equipment, and standard types of glass tubes, to relieve the growing factory load on our tube making plant at Harrison, N. J. Also, additional record pressing facilities were installed at Indianapolis to take care of a rapidly expanding record business and to provide another strategic geographical distribution point.

At this time, RCA Victor decided to make a determined bid for a larger share of the small radio set market. An integral part of this plan was the acquisition of additional manufacturing facilities. Accordingly, in 1940 RCA Victor acquired a modern type factory building in Bloomington, Indiana. Only six months later, RCA's first one-story, straight line production factory was going full blast. Shortly before the war, our Bloomington plant was producing the finest small radios ever to bear the RCA Victor trade mark, at the rate of over a million a year.

The production of custom-built equipment for the U. S. Government has always been very difficult because of rigid specifications which are set down concerning materials, performance characteristics, and penalties for failure to deliver on specified dates. Also, most of these orders were for small amounts of apparatus. However, RCA had been steadily building up the volume of its government business. When the war broke out, RCA's outstanding research and



PRE-WAR TELEVISION RECEIVERS ROLLING OFF THE FINAL ASSEMBLY LINE AT THE CAMDEN, N. J., PLANT OF THE RCA VICTOR DIVISION. THEY WERE THE LARGEST MODELS, TRK-12, BUILT BY RCA.

engineering background, its experienced engineering talent, and manufacturing "know-how" attracted a large volume of Government contracts for the development and manufacture of the most difficult and complex types of radio-electronic equipment. As a consequence, some of the most thrilling chapters in our Company's history has been written in our engineering laboratories and on our production lines.

Almost overnight, and far ahead of most others in the radio industry, RCA began the enormous task of converting virtually all of its manufacturing facilities from civilian to war production. Whole departments and factory floor areas had to be dismantled. Machinery and other equipment had to be relocated in our 4½ million square feet of factory space, in numerous multi-storied buildings.

Not the least important problem of war conversion was the successful training of an army of people to do work which was far different from that required in our normal operations. Many of the workers were new and inexperienced and had to receive extensive training. For example, hourly workers, alone, now on our payrolls number about 23,700, an increase of about 77% over January 1, 1941.

Near the end of 1941, RCA Victor acquired an additional tract of land adjoining our Indianapolis plant. On it were a number of old, low-cost homes and other structures. Our country's need for types of equipment that RCA was able to build was grave and urgent. The story of how this new tract of land was converted into a modern war plant is a dramatic one of speed, ingenuity and resourcefulness. Bulldozers literally swept the old structures off the land to accommodate the building of three additional factory units, each measuring 250′ wide by 500′ long. These three factory units literally rose out of the ground at 90 day intervals. Even as the roof of one factory unit was being finished, production machinery was moved in; and before construction on the next factory unit had begun, production was already coming off the line in the first one.

Since this war has been called both a radio war and a war of movement, in which communications and electronic apparatus play a vital role, it was inevitable that the requirements for electron tubes by the U. S. armed services and our Allies, would far exceed the productive capacity of the entire industry. As the leaders in the field of electron tube manufacture, it was to be expected that RCA would receive a large part of the responsibility of producing electron tubes in every category.

One of the first steps taken at our Harrison plant as well as in Camden and elsewhere, was to rent large warehouse space into which we could move virtually everything that was not actually needed in the production of vitally needed war goods. In Camden, a large structure was erected for this purpose.

### *Tube Factory Built*

However, the Government's needs for cathode ray, power, and special purpose tubes were so great that it was found necessary to provide additional manufacturing space of a kind never before available. Plans for a new factory were drawn up, and with funds provided by the U. S. Navy, a tract of land was purchased just outside of Lancaster, Pa. Within less than six months the most modern tube manufacturing plant in the world had begun the task of producing power and special purpose tubes in quantities that had never before been envisioned. There are no more critical devices than the electron tubes made at our Lancaster plant, and they are being made not only for our requirements to fit into radar and electronic apparatus, but for virtually all manufacturers of such equipment.

Prior to the war, because of the small volume of special purpose tubes that were needed for peacetime purposes, many of the operations were made with hand tools. Urgent war needs stimulated RCA engineers into bringing about a remarkable mechanization of many of these processes. They developed many new types of extremely ingenious machines.

Many new production techniques had to be developed at all of our plants to make possible the manufacture of greater quantities of special apparatus. An example of the ingenuity and skill of RCA Victor factory engineers is in the making of diamond dies. Before the war, diamond dies used in drawing extremely fine wires were made in Germany. Under the stimulus of the war emergency, however, RCA engineers soon developed fine diamond drills that operate at much higher speeds and with far greater accuracy than those of German manufacture. Some of them draw wire as fine as a human hair while revolving at a speed better than 200,000 revolutions per minute.

Almost from the very beginning of the war production program, certain metals became extremely scarce. Here, too, RCA Victor's manufacturing organization displayed great resourcefulness. A substitution program was inaugurated to determine what other materials could be used in place of the scarcer items.



PRODUCTION LINES OF THE RCA VICTOR DIVISION TODAY ARE TURNING OUT VAST AMOUNTS OF RADIO-ELECTRONIC EQUIPMENT FOR THE ARMED FORCES.

# RADIO'S NEW SERVICES

*Research and Engineering Have Developed Radio Far Afield of Telegraphic Communication—New Instruments Aid Industry and Science*



By E. W. Engstrom
*Research Director,*
*RCA Laboratories*

THE history of radio, perhaps more than that of any other technical achievement of modern times, has been one of constant expansion. Starting as a purely telegraphic communication activity, the radio industry rapidly developed to a point where it was not only competing on equal terms with the telegraph and cable but, by enabling communication with moving vehicles of transportation, such as boats, airplanes and automobiles, it provided services which was impossible with the older systems requiring direct wire connections.

As we entered the present war, the later research developments of facsimile, television and FM were just starting on their way to bring sight and improved sound into our homes. RCA research work in radio and electronics did not stop there, however. Even while television and FM were coming out of the laboratory, research was progressing on other services and developments which were aimed at further expanding the usefulness of radio and electronics to mankind. Many of these developments have only a distant relationship to the parent—communications.

The general principles which apply to the field of radio-frequency heating have been known to radio engineers for many years. They have applied them in the manufacture of radio tubes, in heating up the internal tube elements to drive off gasses during the exhaust process. It is only in the past few years, however, as a result of research, that successful efforts have been made to apply these principles to the solution of difficult production problems outside the radio industry. The generation of heat by means of radio-frequency equipment is relatively costly. Radio-frequency power may be seriously considered in a manufacturing process if it accomplishes one or more of the following results: (1) speeds up a manufacturing process; (2) produces a better product; or (3) performs a manufacturing operation that cannot be done by any other means. These conditions are met in many instances and heating by radio-frequency power is increasing in application by industry generally.

### *Two Kinds of Heating*

The particular properties exhibited by radio-frequency heating divide the heating applications into two distinct categories, sometimes called dielectric heating and induction heating.

Objects made of materials which are poor conductors of electricity may be heated uniformly throughout by passing electric currents through them. Thus, heat is generated in every part of the material and the whole mass rises in temperature uniformly. This type of heating is known as dielectric heating.

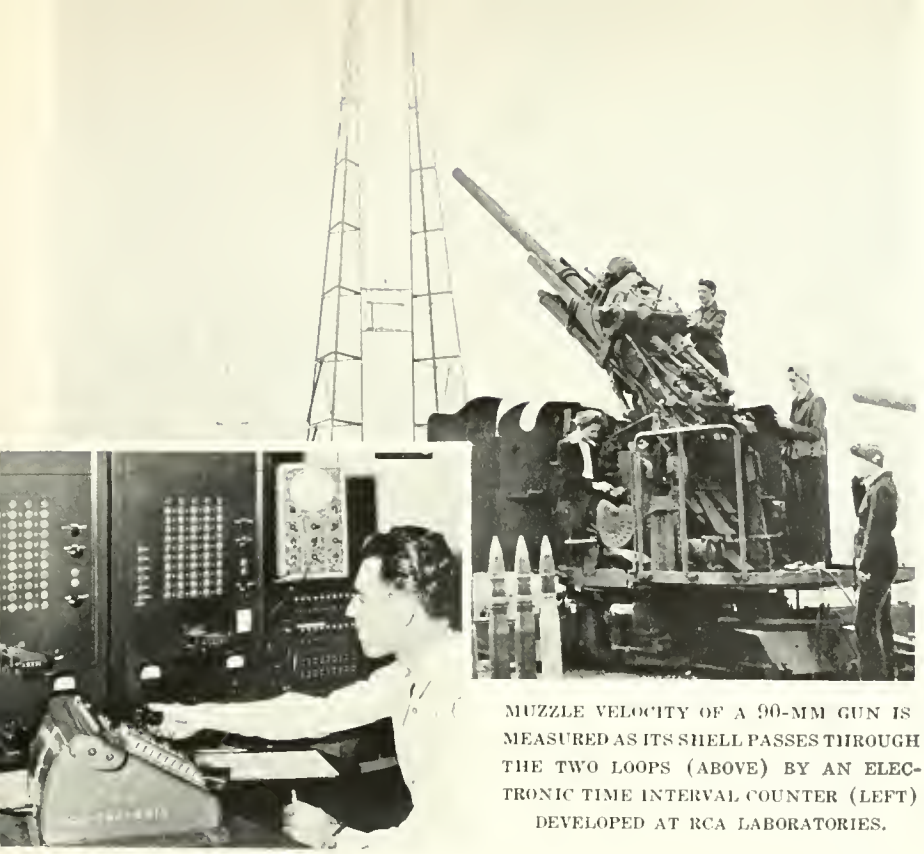
One of the early problems to which dielectric heating was applied by RCA research was the drying of rayon thread. Here, with the aid of equipment for producing a partial vacuum, it was possible to reduce the drying time from 100 hours to less than an hour. Furthermore, a better product resulted when radio-frequency was substituted for more conventional methods of drying.

In the fabrication of wood parts with thermo-setting glues and in the bonding of thermoplastic sheet materials, dielectric heating also speeds up the manufacturing process. The RCA electronic "sewing machine" has been devised to join thin sheets of plastic material in a continuous operation by the use of radio-frequency energy. In the heating of plastic preforms used in molding and in the heating of impregnated laminations for propeller blanks, the manufacturing process is speeded and a better products results from the use of radio-frequency power.

Recently, research in dielectric heating has been turned toward the problem of dehydrating liquids. Radio-frequency heating has been successfully applied by RCA to evaporating the water in solutions

CYRIL N. HOYLER (LEFT), DR. GEORGE H. BROWN, AND R. A. BIERWIRTH INSPECTING THE PENICILLIN DEHYDRATING APPARATUS THEY DEVELOPED AT RCA LABORATORIES.





MUZZLE VELOCITY OF A 90-MM GUN IS MEASURED AS ITS SHELL PASSES THROUGH THE TWO LOOPS (ABOVE) BY AN ELECTRONIC TIME INTERVAL COUNTER (LEFT) DEVELOPED AT RCA LABORATORIES.

of penicillin, and equipment is now in commercial operation for this purpose in the plant of E. R. Squibb and Sons at New Brunswick, New Jersey. In this application, radio-frequency heating has the advantage that it provides a more continuous and simplified manufacturing process and dehydrates the material in a much shorter time than was required by the previous method.

When radio-frequency power is applied to the heating of good conductors such as metals, the currents causing the heating are induced in the object by bringing it into the field of an induction coil which carries radio-frequency current. This type of heating is therefore called induction heating. When good conductors are heated in this way, the induced current, and consequently the heat, concentrates in a thin outer layer or "skin" of the material.

If this type of heating is produced very rapidly, the center of the material will remain cold while the "skin" rises to a high temperature. The principle of self-quenching may then be used since, as soon as the source of heat is removed, the cold center will quickly cool the hot surface just as if the material had been plunged into cold water. Case-hardening in extremely thin layers may thus be accomplished. Recent applications of induction heating have been made to the hardening and tempering of surgical needles and the surface hardening of automobile cylinder walls. In these cases, a manufacturing operation is performed which previously seemed impossible.

### *Microscope Developed*

An outstanding development of radio-electronic research in a different field is the electron microscope.

The electron microscope provides useful magnifications up to 100,000 diameters—50 to 100 times greater than is obtainable with the best light microscope. Many problems of colloidal physics, metallurgy and biology are now being solved by direct observation with the electron microscope. For the first time, the scientific worker is able actually to see the effects of his experiments on the particles and structures that lie in the size range just a little larger than simple molecules.

The fundamental research in electron optics is also making it possible to replace conventional methods of chemical analysis by purely physical methods. As important development in this type of analysis makes use of the fact that the forces which hold each electron in place, in any particular atom, are a characteristic of the type of atom.

The recently developed electron microanalyser is also an instrument of this class. In it, however, the principles of electron optics, developed for the electron microscope, are applied to enable the measurements to be confined to extremely minute areas of a specimen. This new instrument adds to the extension of vision already provided by the electron microscope the possibility of making an elemental analysis of the structures observed. It is a good example of how man, having been given vision in a new world, immediately devises implements which increase his facility of operation in that new world.

In the field of electronic control devices, phototubes have long been a most important element. Much research has been carried on with the aim of improving these tubes. The most outstanding advance in this respect is perhaps the development of practical secondary-emission multipliers. The multiplier makes it possible to build phototubes with a response measured in amperes per lumen rather than microamperes per lumen as is the case with the simple phototube.

The present position of light-sensitive devices, advanced though it is, represents only the beginning of the development, both with respect to photo-emissive surfaces and the apparatus in which they are used.

One of the newest applications of electronics in the field of measurements is the electronic projectile speed measuring equipment developed through RCA research. Until recently, this device could not be described since it was developed for use by the Government Proving Grounds. It is used in determining the performance of all sizes of guns used by our army and navy as well as the uniformity of their ammunition. The equipment consists of an electronic counter which measures, to an accuracy of one hundred thousandth of a second, the



DR. JAMES HILLIER (LEFT) AND DR. V. K. ZWORYKIN OPERATING THE ELECTRON MICRO-ANALYZER DESIGNED TO GIVE AN ELEMENTAL CHEMICAL ANALYSIS OF ULTRA-MICROSCOPIC PARTICLES OF MATTER.

time of flight of a projectile between two coils of wire.

Mechanized sound is normally associated with broadcast receivers and public address systems. Paralleling the growth in other fields of electronics, however, sound is also finding, through research, an expanding scope of utility. High-intensity sound has been used to sterilize, pasteurize, homogenize, and emulsify liquids and to degas and alloy molten metals. Sound has been used to detect flaws in materials. The application of modern acoustic techniques has resulted in an improved acoustic stethoscope. Physiological and psychological studies of hearing combined with progress in acoustics and electronics have made possible a hearing aid of high fidelity.

### *Noise Increase Noted*

The ever-increasing mechanization of factory, office and home has produced a tremendous increase of noise. Means are being developed to combat noise at its source as well as reducing its effect by the use of acoustic absorbing materials.

It is appropriate to mention the importance of radio-electronic research in the war, although we cannot go into details regarding specific projects. This has been a war where armies, navies and air forces have moved and struck with unprecedented speed. Radio and electronic instruments have made this speed and mobility possible.

### *Glimpse at Future*

Speculations as to future developments are frequently and extravagantly expressed in looking toward post-war conditions. Men working in fields of science, however, are usually reluctant to give such predictions. Nevertheless, this article on the non-communication fields of electronics would seem incomplete if some brief glimpse at the future possibilities in these fields were not included. It should be pointed out, however, that although a new development is being thought of or is perhaps even being worked on by research groups, this must not be taken as indicating that a commercial product based on this development will appear on the market shortly after the cessation of hostilities. Frequently, it requires several years between the research work and the marketable product. With this word of caution against expecting too many new products too soon, there may be interest in taking a quick glance at things the radio and electronic research men are thinking about in the fields under discussion.

In the post-war period, uses of radio and electronics for control and navigational purposes will greatly expand. The pre-war limitations of visibility which interfered with the free movements of airplanes, ships and ground vehicles will be removed. They will receive "sight" thru the broad application of radio and electronics.

Electronics will find many new roles, some of which have scarcely yet been visualized in the scientific mind. Presently unused kinds of "light" will add new and greater vision to our eyes. In the fields of measurement, computations, processing and control, electronics will provide new and better methods of doing our daily tasks in the home, the laboratory and the manufacturing plant.

If properly directed, research in radio and electronics can be a major factor in helping to solve some of the human problems in the post-war period. The new products resulting from electronic research, for example, should help to solve the problem of unemployment for those released from our armed services at war's end. Research in radio and electronics should have as its goal the application of its developments to the benefit of all peoples throughout the world. Only then will it be able to make its fullest contribution to a bright and useful future for all mankind in the days of peace ahead. In all this, RCA will have a major part.

PERRY C. SMITH, DESIGN ENGINEER, INSPECTS A NEW UNIVERSAL MODEL OF THE RCA ELECTRON MICROSCOPE.



# AN EXCITING ERA AHEAD

*From Wireless and Phonograph to Broadcasting and Television, Radio Has Developed as an Industry That Promises New Entertainment for the Home.*



By Thomas F. Joyce

*General Manager, Radio, Phonograph and Television Dept.*
*RCA Victor Division*

THE World Almanac carries a list of "Great Inventions," going back to Galileo's discovery of the pendulum in 1581. Of the 250-odd entries, roughly 200, or four-fifths, have occurred in the last century—a mere eye-wink in the calendar of time. These include the phonograph, radio, and television for the home. Not only were these devices discovered within that period; they were also *perfected* to a remarkable degree.

Only 24 years elapsed from the time of Edison's invention of the phonograph to the formation of the Victor Talking Machine Company. Count 44 years from that landmark in home entertainment, and we find ourselves well through the radio cycle, and on the very threshold of the Television Age. Here, within 68 years, is encompassed the whole 3-part history of hearing and seeing the world from your armchair.

Thomas Edison first succeeded in recording and reproducing sounds in 1877, but the invention was largely of academic interest until Berliner introduced the disc record and reproducer in 1897. He called it the "Gramaphone." One of these early Gramaphones was brought for repairs to Eldridge Johnson's machine shop in Camden. Johnson was fascinated by it. He redesigned it and patented a number of improvements. He converted it from a toy or novelty into an instrument suitable for the home. In the Fall of 1901, he formed the Victor Talking Machine Company, which acquired Berliner's patents as well as Johnson's own.

From here out, the story becomes a business fairly tale. From a $500 business the first year, the volume skyrocketed to $3,000,000 in three years, and by 1905 had reached $12,000,000. Both mechanically and aesthetically the Victrola was constantly improved, reaching its climax in the famous Orthophonic of the mid-twenties.

Here the story of the acoustic phonograph fittingly ends. Radio, a lusty newcomer, was feeling its strength and calling for something new.

### *Prediction Fulfilled*

But long before radio had won its spurs, a rising young business executive had made a prediction. Let's go back to 1916. "Radio" was then unknown. It was the age of "wireless." Only four years had passed since the sinking of the Titanic had reemphasized the need for an improved wireless-telegraph communication system. David Sarnoff was Assistant Traffic Manager in the old American Marconi Company. One day, he submitted a report to his superior in which he envisaged programs of concerts, lectures, sports, etc., reaching a vast audience by means of a "radio music box," to be sold complete with amplifying tubes and loudspeaker for $75, and predicted that in a few years' time millions would be sold. He recommended that his company take the lead in this development.

Three years later, the Radio Corporation of America was formed. Before long, Lieut. Gen. James G. Harbord was named President and David Sarnoff Vice President and General Manager. Under this congenial team, and the talented associates they gathered about them, RCA quickly took the lead in developing radio for the home.

In 1922, RCA marketed its first "wireless receiving apparatus" manufactured "in large quantities," and initiated a nationwide distribution system. These sets ranged from a crystal receiver at $25.50 to the 4-tube Aeriola Grand at $409, complete with accessories. Sales were apparently excellent, but the Company's executives displayed commendable caution in print. In the Board Report of 1922, I find this classic of conservatism: *It is the opinion of the officers of your Corporation that radio broadcasting is here to stay. . . .*

Throughout the 'twenties, the engineers of RCA and its associated companies contributed many improvements to receiver design. Radios improved aesthetically, too; they began to look like furniture. Finally, RCA introduced A-C Radiotrons, permitting operation from the light socket. It was considered a great step when these tubes were first applied successfully to the Superheterodyne cir-




FULL-PAGE ADVERTISEMENT RUN BY RCA IN 1923 FEATURED ADVANTAGES OF TWO TUBES OVER ONE IN A RADIO RECEIVER.



BEFORE THE WAR TERMINATED DOMESTIC MANUFACTURING ACTIVITIES, A HIGH MARK IN CRAFTSMANSHIP WAS REACHED IN THIS RCA 10-TUBE COMBINATION RADIO-PHONOGRAPH INSTRUMENT.

cuit, which RCA had introduced for battery operation in 1924, and which eventually became standard for the industry.

Following RCA's purchase of the Victor Talking Machine Company, and the business depression of the early 'thirties, radios began to approach the high degree of perfection that we know today. Small table sets, farm and automobile receivers, portable radios, all found a ready market. It was an era particularly of refinements in circuits and improved convenience for the customer. RCA engineers continued in the forefront with such developments as the Magic Brain, the Magic Eye, electrical push-button tuning and the camera-size Personal Radio, made possible by RCA's development of miniature tubes.

### *Radio and Phonograph Merge*

The merger of radio and phonograph is an interesting story in itself. In the mid-twenties, RCA began supplying Victor and Brunswick with radio mechanisms for inclusion in combination radio-phonographs. These instruments, with their newly developed automatic record changers, enjoyed a moderate success, but they were cumbersome, expensive and subject to mechanical disorders. Then came the Depression, and with it, almost complete extinction of the phonograph. Records, to the public, were out of date, an anachronism. Meanwhile, RCA engineers had developed electrical recording and applied the principle of radio amplification to phonographic reproduction, with results which far surpassed any previous quality. But the public had to be sold. Virtually single-handed, RCA set about doing the job by means of advertising and publicity. The spark was provided by an inexpensive record-player attachment, and its wide distribution through the Victor Record Society. More turntables meant more record sales and a growing appreciation of the vastly improved techniques. Soon the public was again clamoring for recorded music and sales of all kinds of record-playing equipment boomed. Fewer and fewer straight radio consoles were sold. A fine radio-phonograph had become the ideal of every American home.

Coincidental with their work on radios and radio-phonographs, the RCA Laboratories were engaged in exploring many new fields . . . FM, radar and facsimile, among others. They were especially active in television. Here again, Mr. Sarnoff and his associates were years ahead of the times. While television was just a word to most people, RCA's President authorized a research, development and field testing program that to date has cost more than $10,000,000. I think it is safe to say that RCA has contributed more to the technical development of television, as well as more in terms of dollars, than all other companies combined. As a result, television today is very much of a finished product. Later developments will be an extension of the fundamental principles already established.

Television was introduced formally by RCA at the World's Fair in New York, in 1939. Commercial television broadcasting began on July 1, 1941 and NBC's station, WNBT, was the first commercially licensed station to go on the air. Before the War interrupted, several thousand RCA Television Receivers were sold, mostly in the New York area. In spite of the highly restricted nature of wartime telecasts, these owners as a group have remained well satisfied with their purchases (now 3 to 5 years old).

It has been well said that "the history of radio is the history of RCA." As we stand on the threshold of tomorrow's exciting era of sight *and* sound, the Radio Corporation of America appears to be in a better position than ever to lead the way.

NO LARGER THAN A CAMERA, THE RCA PERSONAL RADIO CREATED A SENSATION IN 1940.



# RESULTS OF PIONEERING

*Remarkable Expansion of Radio Reveals How Science and Industry Have Worked Together to Create New Products and Services of Great Usefulness.*



By Meade Brunet

*General Manager,*
*Engineering Products Department,*
*RCA Victor Division*

THE world suddenly found itself on the threshold of a new Radio Age in the year following the signing of the 1918 Armistice. During the war the radio-telephone had materialized from what hitherto had been only a dream of scientists. Now it became possible to send voice and music by wireless waves, instead of merely the dots and dashes which had been transmitted from ship to ship and over short distances on land. At this auspicious moment in the history of communications, the Radio Corporation of America was formed.

Prior to the outbreak of World War II, RCA was one of the U. S. Government's important sources for the development, design and manufacture of extremely essential—and in many cases highly complex—radio, sound and electronic equipment which is playing an unparalleled role in the winning of the war.

Twenty-five years of continuous research by RCA engineers have resulted in the development of highly specialized radio equipment for use in a wide variety of fields. Radio today has many facets, such as aviation radio, emergency communication systems for police and fire departments, ship-to-shore, transoceanic radio communication, facsimile, electron microscopy, AM and FM broadcasting, television, navigational aids, beacons, beams, ultra high frequency equipment, very high frequency apparatus—and in fact, new worlds still beckon.

### *Electron Microscope*

In the late 20's, it was discovered that electrons had a wave length, similar to that of light, and that they could be focused with an electrical lens in exactly the same manner that rays of light could be controlled with a glass lens. In a very short time, experimenters realized that these principles could be utilized in building a microscope using electrons instead of light.

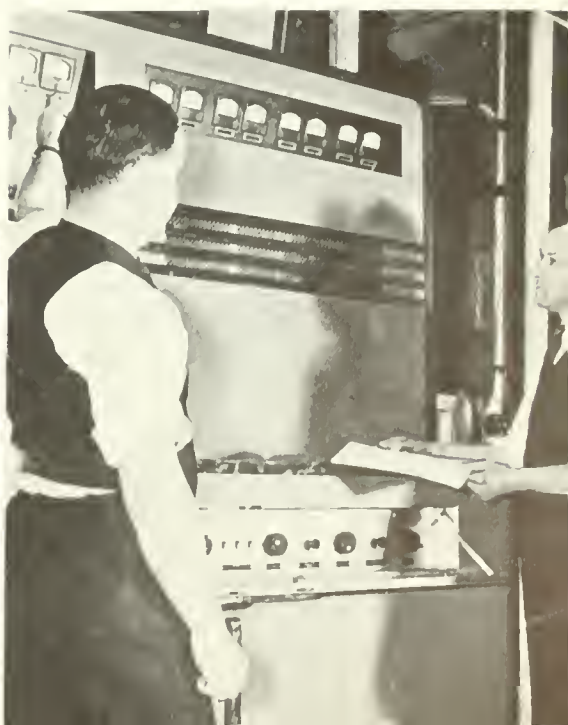
Considerable work had been done on electron tubes, electron optics, television and electron circuits in the RCA Laboratories, so the principles of the Electron Microscope were well known. The expert knowledge thus gained was applied to the development of a practical Electron Microscope, which would be ideally suited to the research laboratory, control laboratory and industry. This work was undertaken in 1938. In 1940, the first commercial RCA Electron Microscope was delivered to the American Cyanamid Laboratories. Today more than 60 of these instruments are in use throughout the world, performing invaluable service in the war effort.

Two new and improved models were introduced in May, 1941—the Universal Electron Microscope and the Console Electron Microscope. The Universal Model is an instrument of great diversification designed primarily for the organization requiring an all-purpose instrument; whereas the Console model has been designed for maximum simplification and is primarily for use in the smaller laboratory, as well as in applications for routine tests.

Few scientific instruments have become of such universal application and importance as the Electron Microscope, which is serving the fields of biology, bacteriology, metallurgy, chemistry, zoology, agriculture and industry. Yet the field of the usefulness of this instrument, commercialized by RCA only four years ago, has scarcely been touched.

BELOW: INTO THE STREAMLINED DESIGN OF THIS MODERN BROADCAST TRANSMITTER, RCA HAS PUT THE TECHNICAL "KNOW-HOW" DEVELOPED FROM MANY YEARS OF EXPERIENCE. RIGHT: THE SAME HIGH SKILL WAS APPLIED TO THE DESIGN OF PRE-WAR TELEVISION TRANSMITTING EQUIPMENT.





The use of radio in the emergency communications field was established about fifteen years ago when the Federal Communications Commission granted the first licenses for police service. Other public service agencies soon recognized the value of the communications medium, and the FCC sanctioned the use of radio by Fire Departments, Public Utilities, Forest Services, Geophysical Survey, Highway Patrol and other uses.

The purpose of radio in such services is the transmission of important information which cannot be conveyed immediately by any other means. Most emergency communications applications involve the use of mobile units, which can be contacted only by radio.

The first radio installations in this field were of the one-way type where messages could be transmitted only from headquarters to mobile units. These systems operated on the medium frequency band just above the standard broadcast frequencies. RCA then entered into the pioneering development of apparatus to operate in the 30-40 mc portion of the spectrum. This notable contribution revolutionized the emergency communications field. It made possible the design of two-way equipment where messages could be transmitted in both directions between headquarters and mobile units. It reduced the effect of atmospheric interference, eliminated such long range interstation interference and elaborate antenna systems, and provided frequency channel space for small as well as large communities.



SOUND RECORDING EQUIPMENT WAS INSTALLED BY RCA IN THE NEW YORK OFFICES OF OWI FOR USE IN OVERSEAS BROADCAST TRANSMISSIONS.

*Pioneer in Relaying*

RCA also pioneered in automatic, unattended radio relaying. The Pennsylvania Department of Forests and Waters System and the famous Pennsylvania Turnpike Network are outstanding examples of "firsts" in this field. Large areas are served by these systems, whose unattended relay stations automatically pass on received signals to the next station and so on until the entire network is covered.

Frequency modulated equipment for the emergency services was developed in the 30-40 mc band. This type of equipment offers great advantages and developments of the past few years will provide standards of performance never before possible.

When conversion to peacetime manufacture again permits production of apparatus for the emergency services; new services, such as two-way radio for railroads, will be established. New portions of the frequency spectrums will be explored and put to use and new devices which are restricted to war use will be applied. The future of the Emergency Communications Field is one of great promise.

Prior to the war considerable work was done on the use of facsimile equipment in the emergency services. These developments found ready application in the war program and tape facsimile apparatus is playing an important part in armored force communication. The knowledge gained in this military application will provide a valuable medium for emergency communication use when production of equipment for such purpose is resumed.

In the 25 years since RCA was founded, aviation communications have successively shifted from the low frequencies, to the medium high frequencies and finally to the Ultra high frequencies. This trend has been materially assisted by the many new techniques and components which RCA research has made possible.

RCA developments in vacuum tubes have led the industry and have furnished the nucleus around which improved apparatus has been built. RCA miniature tubes, for example, have made possible the development of new airborne radar and radio equipment at lower weight and size than ever before. RCA television developments have provided the advanced cathode ray tubes, without which certain military aviation equipment would be impossible.

Turning to specific aviation applications, the first commercial production of the "streamlined egg" loop antenna was made as early as 1934, and has since become an almost standard feature on every modern airplane. The anti-static



RCA'S DEVELOPMENTS IN RADIO FACSIMILE RECEPTION, NOW TURNED TO WAR PURPOSES, MAKE POSSIBLE THE PRINTING OF NEWSPAPERS IN THE HOME.

value of the metallically shielded loop, which came out of RCA marine developments, has become so important that such a loop is now required by law on all air transport planes.

One of the major advances in aviation radio came from a combined RCA-Sperry Gyroscope Company project which resulted in the automatic direction finder. This invention abolished the necessity for pilots turning either the loop or the airplane in order to get a bearing on a distant station.

In 1941, RCA's automobile radio experience was applied to private airplanes, with the result that expensive ignition shielding was made unnecessary by the installation of RCA receivers under RCA supervised airplane production line techniques. This cut the cost of private plane receiver installations nearly 50 per cent.

### *All Types of Equipment*

RCA makes every type of equipment used in broadcasting stations, from the microphone to the antenna. Practically every broadcasting station is now equipped with RCA microphones, and RCA studio amplifying and record reproducing equipment are universally used.

As of 1944, 324 standard broadcasting stations are equipped with RCA transmitters—more than that of any other manufacturer. Forty per cent of the total licensed power in the United States is being broadcast from RCA transmitters. A number of FM broadcasting transmitters have been delivered and RCA is prepared to manufacture a complete line of FM equipment after the war. A large number of standard band and short-wave broadcasting transmitters have also been supplied foreign countries and U. S. Government agencies.

Many advanced design features for AM and FM broadcasting transmitters have been developed by RCA engineers, and their pioneering research work on antenna and ground systems has proved of great value to broadcasters.

The universally known RCA velocity microphone improved the fidelity of the broadcasting system and its familiar design has literally become almost another RCA trademark.

### *Aircraft Television*

RCA may be justly proud of its pioneering development of television transmitting equipment which varies all the way from the pick-up tube through to the transmitting antenna.

In 1937, RCA developed and constructed its first aircraft television system. The experience gained in that work has since been used to great advantage in the development of the first high frequency television system for relay work.

In the industrial field, RCA television has found important use in one of the nation's large industrial plants. Such equipment is expected to have a wide field of usefulness in observing dangerous or inaccessible industrial or testing processes.

In the military field, RCA's outstanding position as the pioneer and leading supplier to the Armed Forces is unchallenged. History will record the part it is playing in the war effort.

The more widespread use of electronic apparatus made it necessary for RCA to develop special devices which would make it possible for users of RCA communications equipment to test and measure the performance characteristics of their equipment to insure maximum operating efficiency.

The revelation of RCA's spectacular contribution of electronic products in this highly-specialized World War II must of necessity await the end of the war. When the story can be told, it will become a classic in industrial history.

Broadly speaking, there are two types of Government business. One consists of a relatively small number of contracts that entail large factory runs and large monthly shipments. The other is to produce a wide diversity of highly intricate products requiring extensive research, development engineering and manufacturing "know-how." Because of RCA's obvious qualifications and experience in producing the more difficult types of electronic apparatus, that is the field in which RCA was able to perform greater national service.

In peacetime, the added experience and new skills gained in the engineering and manufacturing of these critical wartime products will be applied to the design and production of the most advanced communications and electronic apparatus that has ever borne the RCA trademark.







LEFT: FM "TURNSTILE" ANTENNA DEVELOPED BY RCA AND INSTALLED FOR A PHILADELPHIA STATION. CENTER: FIELD INTENSITY METER USED FOR MEASURING COVERAGE OF FM AND TELEVISION STATIONS. RIGHT: RADIO-TELEPHONE EQUIPMENT IN A POLICE CRUISING CAR.

# ALADDIN'S ELECTRONIC LAMP

*Tube Paces Progress of Era and is a Magic Weapon, Aiding and Protecting Soldiers and Sailors on Fighting Fronts Throughout the World.*



By L. W. Teegarden

*General Manager,*
*Tube and Equipment Dept.,*
*RCA Victor Division*

IF ALADDIN were living and performing his incredible feats of magic today, he might well wish to modernize his equipment by discarding the famous lamp! Yes, the *electron tube* is the modern successor to Aladdin's Lamp because tubes literally pace the progress of the electronic era.

There is a *magic weapon* which is aiding and protecting our men on fighting fronts throughout the world. At the same time, there is a magic tool which is helping our men and women at home to achieve unprecedented feats of production in American war plants. Weapon and tool are the same—*The Electron Tube.*

Of its numerous and varied wartime uses, little may now be said—except that it is helping to seek out and destroy the enemy wherever he may be.

Almost as little is generally known of the industrial uses of the electron tube. Most of us have seen it open doors in busy railway stations, or know that it is functioning quietly, but efficiently, behind the tuning dials of our radio sets. It is generally known that the electron tube has been serving us for years in radio broadcasting; in the recording and reproduction of sound for motion pictures and for phonograph discs; in long distance telephone; and in numerous other unobtrusive, but important ways.

Comparatively few know that the electron tube has been rapidly extending its usefulness so that it is helping to solve many problems in industry. For example, in the accurate matching of colors; in testing and inspecting; in making accurate measurements; in providing safety controls; in high-frequency heating equipment; in controlling intricate manufacturing processes with a precision impossible with human or mechanical control alone; and in almost countless other ways.

Perhaps the term "electron" tube is a bit new and somewhat confusing; yet, at one time, they were generally known as "radio" tubes, then "vacuum" tubes. But neither term was precise, since they are used today for many non-radio purposes and some of them contain gas. Hence the term "electron" tubes, the element that *controls and powers* electronic devices.

Introduction of the AC powered radio tube by RCA made possible all-AC operated radio sets, powered from a convenient electric wall socket. Similarly, the development of the Iconoscope, or electronic eye of the television camera, and the reproducing Kinescope or "screen" of the home television receiver, made possible practicable, all-electronic television. A special development in phototubes—another form of electron tube—made possible the development of RCA's famous ultra-violet method of recording sound-on-film which brought new realism to sound motion pictures.

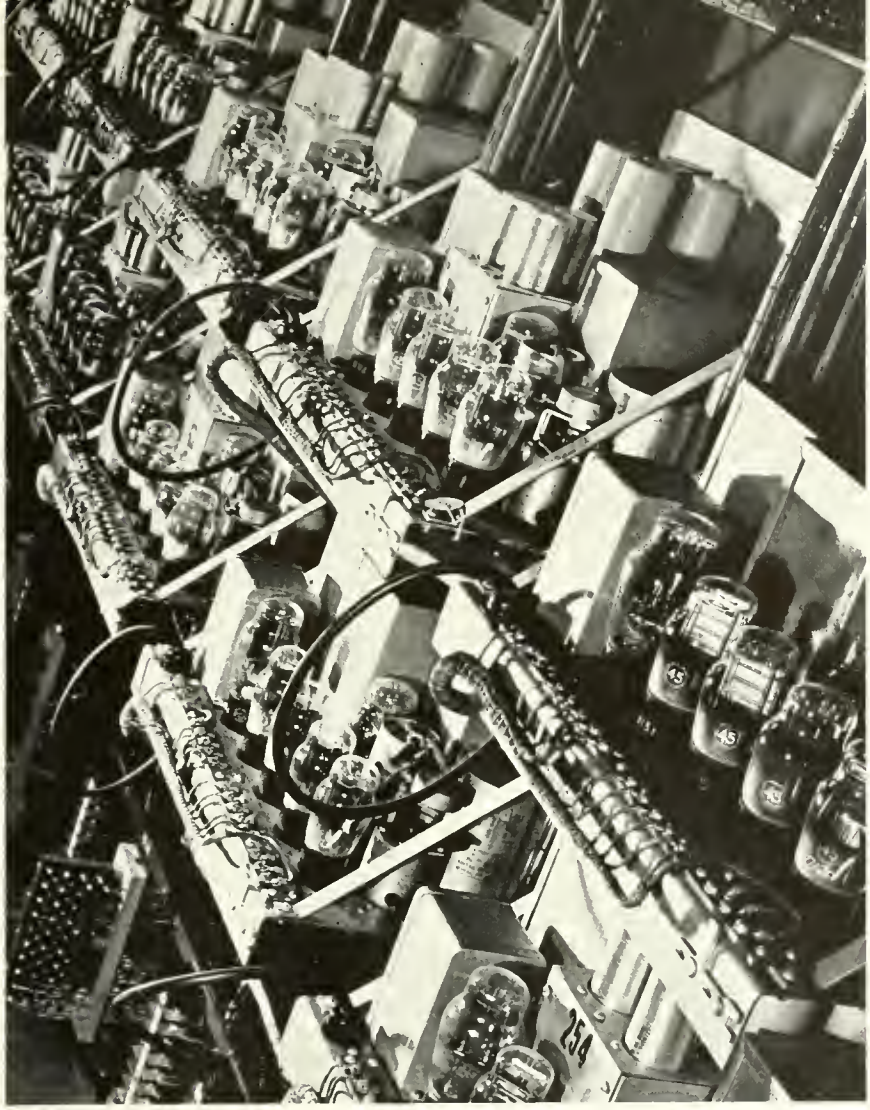
In 1940, the "Personal Radio" receiver made an auspicious debut on the market. It was no larger than a camera and could be carried everywhere conveniently. That personal radio was *historically important.*

The advent of miniature tubes stimulated engineers to re-design and scale down other radio com-



BELOW: MAGIC TUBE OF TELEVISION IS THE ICONOSCOPE, "EYE" OF THE CAMERA THAT PICKS UP SCENES AND TRANSLATES THEM INTO ELECTRICAL IMPULSES. RIGHT: MANUFACTURING THE KINESCOPE, WHICH REPRODUCES IN A RECEIVER THE SCENES SCANNED BY THE ICONOSCOPE.





THIS FINE PHOTOGRAPH OF "TUBES AT WORK" SHOWS THROUGH THEIR VERY NUMBER THE VITAL PART THEY PLAY IN MODERN ELECTRONIC EQUIPMENT.

ponents—condensers, coils, speakers, batteries, and other parts—all of which made possible greater flexibility in the application of electronic devices to the home, to aviation, to shipping, to industry, to the armed services, and wherever space and weight are important considerations.

RCA's famous metal tubes, too, are still another example of progress through tube leadership. Some years ago, RCA pioneered in the manufacture of metal encased electron tubes to supplant many glass types because of technical, physical and manufacturing advantages.

The whole future of radio, sound and electronics is dependent on electron tubes. It is an open secret that many of the electronic advances, like Radar, now playing important wartime roles, can be expected to play important peacetime roles.

Electronic power generation, made possible by high-frequency power tubes, to heat plastic preforms, solder, harden, anneal, glue, dry, and otherwise treat a variety of materials, is finding ever-widening fields of use in industry. Electronic test and measuring equipment, safety controls, precision selection and automatic control equipment foreshadow the greater "electronization" of industry.

Developments in the field of "electron optics" have not only advanced television, but have produced the famed RCA electron microscope.

Exploration not only of the Ultra-High Frequencies, but also of the Super-High Frequencies, gives promise of providing an almost limitless number of channels for additional services. More extensive use of public address and sound amplifying equipment is being found in every field of human activity.

Through the years, RCA men and women working in laboratories, offices and factories, have acquired a unique "know-how" about electron tubes. This "know-how" has resulted in a remarkable record of successively lowered costs and improved performance which has advanced immeasurably the science of electronics. It has, in effect, placed the United States in a position of world leadership in the design, development and production of radio, sound and electronic equipment.

Our country and the United Nations have therefore called upon RCA and other tube manufacturers to produce enormous quantities of electron tubes. That is why there has been such a shortage of tubes for civilian radios.

The many electronic devices that one hears about from day to day, and those that are being planned for tomorrow, all have one thing in common — they all use *electron tubes*. As the "control element" in every piece of electronic equipment, tubes are the nucleus about which the machine or device is created. That is why tubes pace the progress of the electronic era — and that, too, is why *tubes are truly the keys to progress in the radio industry.*

## War Programs Increase

NBC sustaining programs devoted 419 hours, 42 minutes to the war effort during the first six months of 1944, a gain of approximately 30 percent over 1943, a survey by Program Analysis reveals. In the same period WEAF, the network's New York outlet, carried war effort programs and announcements on a sustaining basis totaling 145 hours, 4 minutes, 1,725 announcements and 1,114 programs—almost sixteen a day—accounted for the network time.

# SOUNDS OF PROGRESS

*Application of Radio Devices and Methods to the Recording and Reproduction of Sound Has Widened Its Use in Motion Pictures and Other Fields—Radiothermics is New Service to Industry.*



By Edward C. Cahill

*General Manager,*
*Industrial & Sound Department,*
*RCA Victor Division*

IN WAR ZONES sizzling with the heat of battle, RCA sound equipment is directing military personnel and helping to protect the lives of our fighting men. In Allied military posts throughout the world, it is training, instructing, orienting and helping to maintain the morale of both men and women in uniform.

On the production front, RCA industrial sound is increasing workers' efficiency and saving valuable production time, while RCA electronic heating is dramatically increasing the efficiency and speed of many industrial processes.

The electronic equipment accomplishing these spectacular services includes motion picture and sound recording and reproduction equipment, public address and plant sound systems, radio-frequency heating, or radiothermics, and other industrial devices. Some of these sound products have resulted from RCA's years of continuous research in the electronic field. Others have been created more recently to meet emergency war needs.

Among the newest, and perhaps least generally known of the many RCA electronic products, are those being used in industrial processes, especially in the fields of plastics, metals, and textiles.

Older, and more widely known, is the application of electronic sound to silent films, which made the motion picture a more complete and realistic medium of mass entertainment.

RCA's spectacular contributions to the motion picture field date back to 1928. In that year, which witnessed the birth of the "talkies", the RCA Photophone Company was organized as a subsidiary of the Radio Corporation of America.

### *Sound on Film*

In the early days of the "talkies", sound was recorded on phonograph discs and reproduced by playing the discs in synchronization with the moving film. It was RCA engineers who pioneered in developing the technique, which is now standard, of recording sound on the film with the picture. In 1930, RCA contributed the first completely AC-operated motion picture sound equipment.

Marked improvements in sound quality of motion pictures were effected by RCA developments, such as the Rotary Stabilizer, which insured the smooth, uniform movement of film through both recording and reproducing machines. RCA's magnetic drive recorder eliminated "flutter" which had been caused by unsteady film speed in recording. In 1932, RCA's "High Fidelity" sound reproducing systems, newly designed throughout, made their debut and constituted one of the most important contributions toward bringing realistic sound to the motion picture.

Another major advance in motion pictures came in 1935, with RCA's introduction of ultra-violet light recording and printing to overcome photographic distortion of the sound waves on film. Continuous improvements in RCA loudspeakers have provided increasingly greater efficiency in reproduction and distribution of the full range of sound.

In 1940, RCA introduced an entirely new type of motion picture sound recording and reproduction which gave a realistic third-dimensional effect of sound and music. Produced for Walt Disney's FANTASIA, the new development was christened "Fantasound". Soon after its introduction, a simplified version, called RCA Panoramic Sound, was developed in the RCA research laboratories. This adaptation supplements modern standard sound systems at a small fraction of the cost of the elaborate Fantasound system.

At the beginning of World War II, RCA was accounting for a large part of all the motion picture theatre sound equipment sold in the United States. Luxury picture palaces and crossroads movie houses on every continent are using RCA equipment, and RCA recording equipment has been adopted by





CHEERY WORDS AND MUSIC PICKED UP BY THE MICROPHONE (RIGHT) AND REPRODUCED BY THE LOUDSPEAKER (LEFT) IN PLANT BROADCASTING SYSTEMS HAVE ADDED IMMEASURABLY TO WAR PRODUCTION MORALE AND EFFICIENCY.

such leading movie producers as Warner Brothers, Columbia, RKO, Republic, 20th Century Fox, Walt Disney, The March of Time, and Pathe News. Abroad, British pictures have been predominantly RCA recorded, while in Latin America, studios are equipped almost exclusively by RCA. Today, RCA is the only organization actively engaged in every phase of motion picture sound, from the studio to the theatre.

In the war program, RCA theatre and film recording equipment has been playing a vital role, being used to make and to screen sound motion pictures for entertainment, training and orientation of troops, and for combat records to aid in the shaping of war strategy.

### *New Picture Projector*

Of particular interest among developments in design and construction which have sprung directly from wartime requirements is the new RCA 16 mm. projector developed for the U. S. Signal Corps. Shock-mounted on rubber in a tough plywood case, this projector has been engineered to function even after being dropped on a concrete floor from a height of 18 inches. Another major war contribution is RCA's Magicote lens-coating process. Before the war this process provided improved lenses for motion picture cameras and projectors. Now it is helping to provide superior binoculars, telescopes, and fire control apparatus for American troops.

Not confined to the entertainment field, electronic sound now reaches into nearly every phase of human experience. Installations of equipment for sound amplification and inter-communication have been made in restaurants and dining rooms, baseball parks, department stores, transportation terminals, hotels, banks, and night clubs. RCA sound systems are also installed in power plants, courtrooms, prisons, and police stations.

### *Sound Systems in Churches*

Many churches now have RCA sound systems, supplemented by the new 26-note carillon which takes the place of costly and space-consuming bells. Schools are other users of RCA sound equipment, including 16 mm. sound films, for instruction and entertainment. The RCA Telekom System is installed in many business offices, providing instant, quiet inter-communication which saves time and reduces the load on telephone facilities.

In the 1930's the RCA plant broadcasting and industrial music system was born in the Harrison, N. J., plant of RCA Victor. Installations have since been made in leading steel, chemical, textile, automotive, shipbuilding, aircraft plants, U. S. Navy Yards, and other vital industries.

Shortly before the war, RCA became active in the field of electronic power heating, that is, heating with high-frequency power obtained from an electron tube oscillator. Urgent demands of war production have since dictated the direction of development in this field. Even in its short history, electronic heating has made possible dramatically increased accuracy, thoroughness, efficiency, and speed in such processes as molding and bonding of plastics and wood products; case-hardening, welding, soldering, annealing, and tempering of metals; seaming of fabrics; and drying of textile yarns.

As with electronic heating, so with every phase of radio, sound, and electronics, RCA scientists and engineers have pioneered in history-making advances. The priceless experience and skill which has thus been accumulated during the past twenty-five years insure even greater RCA industrial and sound products for the next quarter-century of progress.

## Coastal Station Opens

Radio station WPA of Radiomarine Corporation of America, located at Port Arthur, Texas, resumed operations with ships at sea on October 15 by authority of the Federal Communications Commission.

Serving the Port Arthur area and the Gulf of Mexico, station WPA, operates on both short and long range channels allocated for marine communication. It is the third of twelve Radiomarine coastal stations, closed since the early days of the war, to resume ship-to-shore radio telegraph service as now needed for the safety of men and ships.

Last February Radiomarine resumed operation of WNY, New York, and WOE, Lake Worth, Fla., for commercial message traffic.

RCA IS A LEADER IN APPLYING ELECTRONICS TO NON-COMMUNICATIONS PURPOSES. LEFT: DEMONSTRATING A 16-MM SOUND MOTION PICTURE PROJECTURE. CENTER: DETONATING EXPLOSIVE RIVETS USED IN AIRPLANE MANUFACTURE. RIGHT: HEATING PLASTIC PRE-FORMS FOR MOLDING INTO FINISHED PRODUCTS.







# "NIPPER" LISTENS IN

*Radio's Alliance With the Phonograph and Use of Electronics in the Production of Records Keep "His Master's Voice" a Symbol of Tonal Quality—How Discs Are Made.*



By J. W. Murray

*General Manager,*
*RCA Victor Record Activities*
*RCA Victor Division*

THE insistent purr of a buzzer cuts across the studio, hushing abruptly the babble of voices, the scraping of fiddle strings and the random tunes of the reeds. It's the "get ready" warning.

Musicians adjust their chairs, poise instruments, and fix their eyes on the conductor standing before them. In an adjacent control room, sound technicians carefully make last-minute inspections of their equipment.

Suddenly the buzzer sounds again —two quick, warning sounds.

The conductor silently signals for attention, then spreads his arms in a sweeping gesture and a great concord of music pours forth from the orchestra.

### *Music Recorded*

Round and round in slow rhythm, turntables in the control room spin their even way, and a cutting needle dips smoothly and accurately into a wax-coated disc.

Another masterpiece of melody is being etched indelibly on a Victor record to be added to the world's musical treasures.

With this impressive routine in an RCA Victor recording studio in New York, or Chicago or Hollywood, a whole chain of events is set into motion—an interdependent series of activities in engineering, manufacturing, packing, shipping, advertising, promotion and distribution.

With all of these interdependent activities functioning, the "Music America Loves Best" finds its way from the recording studio into millions of homes, in war plants or on some far-off military outpost.

### *"Nipper" Becomes Famous*

The old Victor Talking Machine Company, and later RCA Victor, spent millions on scientific development of the phonograph, on the improvement of recording methods, in signing up the world's finest artists, and in advertising the advantages of recorded music. It is interesting to note that Victor acquired the famous oil painting of the dog "Nipper" from an English painter, Francis Barraud; and in the first 25 years spent $24,000,000 in making the dog, listening attentively to "His Master's Voice", one of the world's best-known and best-loved trademarks.

In 1930, the phonograph joined hands with its erstwhile rival, radio, when the Radio Corporation of America acquired the Victor Talking Machine Company. The depression caused Victor record sales to drop to a mere 3,000,000 discs in 1933, but through those dark days RCA engineers were making continuous improvements in recording and sound reproduction. The phonograph kept pace with progress so that it was ready for a comeback when the world economic situation improved and people once again had money to spend for the good things of life.

With the advent of more prosperous days, the popular demand for recorded music increased so fast that the industry's record production was unable to catch up with it. In 1942, RCA Victor attained a new all-time high in record production of 59 million units. This total is especially significant when compared to the 250,000 units produced by Victor in 1901; the 55 million units produced in 1921, the previous all-time high; and the slightly more than 3 million produced during the depths of the depression. Records have scored a comeback in popular favor that has few if any parallels in industrial history.
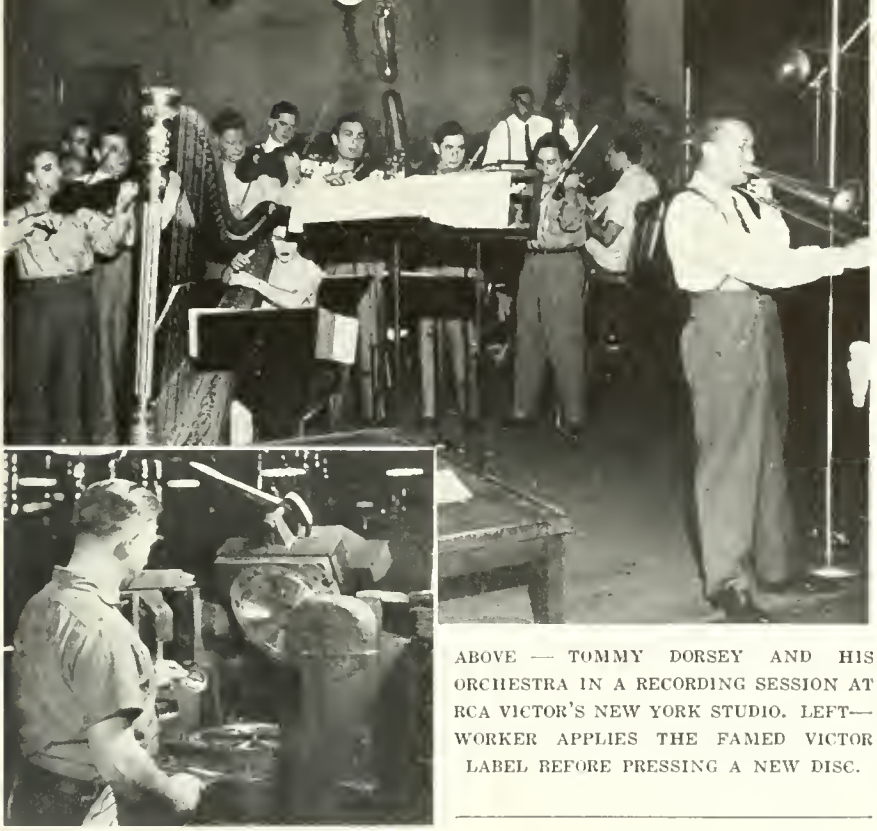
World War II brought many problems to record manufacturers. It was soon realized in this country, as it had been in England, that recorded music is of great importance to national morale. It helps entertain and refresh the spirits of the people at home, who are working longer hours and living under the stress and worry of wartime. To service men in camps and at battle stations all over the world, recorded music is like recapturing a few moments of "home"; it has been of inestimable value in relieving the tensions that precede and follow combat. In the war factory, too, recorded music is helping to relieve fatigue and inspire production soldiers in their job of making American fighting men the best equipped in the world.

### *Production Maintained*

In the face of rapidly increasing demand for records, the industry was confronted with limited manufacturing facilities, manpower shortages and scarcity of materials.

Despite all existing problems, RCA Victor has continued to maintain a high standard of quality and to keep up a flow of records which has served to fill most fundamental needs. In order to bring the benefits of recorded music to the greatest number, RCA Victor has had a wartime policy of concentrating its production on those types of music desired by the greatest number in every category of musical taste.

From time to time, through the years, there has been speculation about so-called "revolutionary" new methods of recording. For example, it is pointed out that entire symphonies can be recorded on a strip of film, or tape, or a wire. RCA is in close touch with such



ABOVE — TOMMY DORSEY AND HIS ORCHESTRA IN A RECORDING SESSION AT RCA VICTOR'S NEW YORK STUDIO. LEFT—WORKER APPLIES THE FAMED VICTOR LABEL BEFORE PRESSING A NEW DISC.

developments, through its great research laboratories and its experience in motion picture sound, radio, and allied fields. Some of the "new" recording methods have already found fields of usefulness in sound motion pictures, in the armed services, and some phases of commercial recording. RCA naturally is interested in developing the ultimate possibilities of these recording techniques for the benefit of each of the fields in which it operates.

### *Records Ideal Medium*

However, it is our considered opinion that nothing now contemplated in the laboratories or in use commercially at present shows any signs of offering such flexibility, tonal fidelity and simplicity—at low cost—as do the present high quality disc and phonograph.

Records are the most convenient and economical way through which to hear the music we want as performed by the world's greatest artists, at our will. Records provide music of exceptionally high quality in such a simple form that a child can make full use of them. Moreover, the disc method offers the important advantage of pre-selection. We may hear any portion of a symphony or all of it, as our tastes and desires dictate. The perfection of automatic record-changing mechanisms of low-cost within recent years has made it possible to pre-select a symphony or musical program that can be played for more than an hour.

### *New Applications*

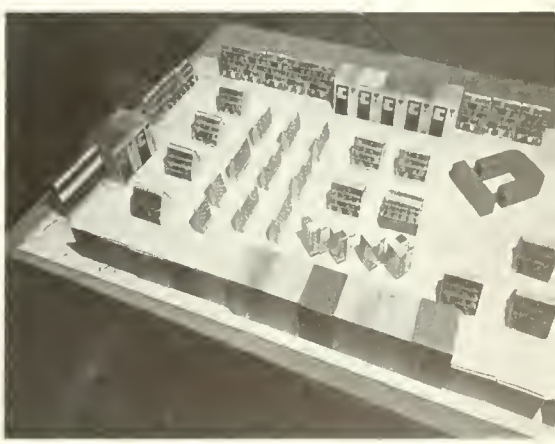
There is every indication that public appetite for music of every type is still on a sharp swing upward. Radio, the concert hall, and the stage only partially satisfy this appetite. Moreover, recorded music is finding new and valuable applications in many fields.

Industrial music—playing of recorded music over internal plant broadcasting systems — has come into wide use in England and in our own country during the war, because of its value in relieving workaday fatigue and improving morale. As wartime restrictions on the manufacture of industrial broadcasting systems are lifted, there will be a commensurately larger demand for records in this activity.

In the field of education, records have still to attain a large part of their potential usefulness, not only in the field of music appreciation where records have pioneered, but also in supplementing other studies. The study of geography and history can be made infinitely more dramatic and lasting through the use of records. Such recordings as Raymond Massey's readings of Abe Lincoln in Illinois, and President Roosevelt's Declaration of War Speech give greater point to printed history.

When the war is over, music lovers may look forward to many improvements in recorded music, but not necessarily overnight. There is every indication that improved record compounds will be found in the synthetics or plastics, to provide better records, with less surface noise and which are less liable to breakage. Further progress will be made, too, in developing the techniques of recorded orchestral music for the dimensions of the home, as distinguished from performances designed for the concert hall. This means even more natural quality than today.

With popular interest attaining continuously new heights and with steady technical and manufacturing improvements in sight, the record industry and all those who benefit from its output—music lover, student, educator, factory worker, and record-dealer — may look forward with confidence to another great era for recorded music.



MINIATURE LAYOUT OF SELF-SELECTION STORE FOR RECORDS DEVELOPED BY RCA VICTOR AFTER TWO YEARS OF RESEARCH IN RECORD MERCHANDISING.

# RADIO 'ROUND THE EARTH

*Future of Radio is Called "International" With New Markets in Prospect as People Throughout the World Seek to Gain the Benefits That Radio Spreads Across the Hemisphere.*



By Jay D. Cook

*Managing Director, International Department, RCA Victor Division*

THE Radio Corporation of America is now, and always has been, internationally minded. The present-day scope and complexity of the international business of the RCA Victor Division derives from nearly half a century of diverse history, beginning as it does with the activities of the old Victor Talking Machine Company at the turn of the century.

International radio communication was the principal business of the Radio Corporation of America at the time of its formation in 1919. It was therefore natural that as its interest in product selling and merchandising developed, the Radio Corporation of America should promptly carry the promotion of each of its new businesses into the foreign markets.

The contract which the Radio Corporation of America entered into with the Polish Government in 1923, under which the latter Government purchased a 200 kw Alexanderson alternator which was installed by RCA at Warsaw, represented the first important foreign sales transaction consummated by the newly created American radio industry. That transaction provided Poland with its first means of trans-oceanic communication and marked an era for the international radio field.

The development of relatively low-cost, long distance short-wave radio communication apparatus by RCA further stimulated the sale abroad of radio communication apparatus. The first high power (20 kilowatt) short-wave communication transmitter installation was shipped abroad by RCA to the Argentine in 1926; in 1927, a similar installation was shipped by RCA to Khabarosk, Siberia, and in 1929 a newly designed 20/40 kilowatt transmitter was installed by RCA at Mukden, Manchuria.

In 1930, still another new field in radio communication was pioneered by RCA when it made the first ultra-high frequency radio communication installation for the account of the Mutual Telephone Company in Hawaii to provide inter-island telephone communication.

After the birth of the radio broadcast entertainment business in the United States the commercial development of this new industry was quickly carried to the international markets by RCA. In 1922, the first radio broadcast transmitter shipped abroad was installed in Buenos Aires by RCA and opened the market for the sale of broadcast receivers for home entertainment in Latin America. With the development of high power broadcast transmitters by RCA, the first 50-kilowatt radio broadcast transmitter was shipped by RCA to Italy in 1929.

To the world-wide sale of radio communication apparatus, radio broadcast station equipment, and radio receivers for home entertainment, RCA added a new business when electronically reproduced sound was coupled with pictures in the cinema industry in 1927. In addition to the cultivation of this new business activity through its already established channels abroad, RCA set up subsidiary operations in England and Australia to specialize in this new industry.

With the consolidation of the Victor Talking Machine Company and the Radio Corporation of America in 1929, RCA acquired a well established foreign distribution organization, experienced in the sale of specialty products. This distribution supplemented the electrical distribution channels upon which RCA had been previously dependent for the export sale of its radio broadcast receivers. Thus strengthened in its international merchandising activities, and for the first time possessed of complete control over its production facilities through the acquisition of the Victor factories, both at home and abroad, the International Department of the RCA Victor Division was enabled to embark on a program of development of products especially designed for the needs of the export market.

With these factors in mind, RCA developed a line of export broadcast receivers which proved very successful and enabled RCA to attain an outstanding position among American exporters of radio ap-

MOBILE CINEMA UNIT EQUIPPED BY RCA PARKED IN FRONT OF THE OFFICES OF RCA PHOTOPHONE PTY., LTD. IN SYDNEY, AUSTRALIA.



paratus during the ten-year period prior to the war.

Concurrent with the growth and development of our international merchandising activities, it became increasingly apparent that we were in a position to handle efficiently allied products of other manufacturers in addition to our own products. Thus, in 1938 we undertook the sale of coin-operated phonographs in Canada, and the year following extended this activity to other markets of the world. In 1939, we began the export distribution of a line of electrically operated washing machines, ironers and vacuum cleaners for the home, and recently have made arrangements for the post-war export distribution of electrical household refrigerators.

To foster the expansion of our international sales of radio communication apparatus, as well as of radio broadcast station equipment, it became necessary to design a line of special export products. Before World War II began, sufficient progress had been made in that endeavor so that RCA's line of export transmitters found considerable military application by the allied governments. This resulted in our securing important war orders direct from many of the allied governments prior to our entry into the war, and subsequently RCA received very substantial orders for the same products through Lend-Lease. As a consequence, standard RCA trademarked communication equipment in large quantities has played an important role in all the important theatres of war and has created many new friends throughout the world.




HIGH OVER THE TURBANED HEADS OF NATIVES, THE RCA MONOGRAM SPELLS OUT ITS MESSAGE OF GOOD RADIO IN A FRENCH MOROCCO TOWN.



PERUVIAN SUB-DEBS AND THEIR FRIENDS TUNE-IN A SOUTH AMERICAN BROADCAST ON AN RCA VICTOR TABLE MODEL RADIO RECEIVER.

Supplementing the RCA line of radio communication apparatus, we have made arrangements to handle the export sale of complementary products so that post-war, we will be in a position to supply complete communication systems to solve even the most complex problems.

The development of our motion picture sound recording and reproduction business abroad gave rise to problems, the solution of which again required the design of special products for export sale. Progress was made through the development of the so-called "standard" line of theatre reproducing equipment, as well as of the portable sound-film recorder.

In order to improve our commercial position in this field, and to meet the efforts of competition, we have made arrangements to handle and promote the sale of virtually a complete line of equipment required by a motion picture exhibitor. This entry into the "Theatre Supply" business in export will have the effect of more than doubling the potential future dollar volume of export sales of theatre equipment to exhibitors.

RCA has always had an enviable reputation in the international market for the quality of its electron tubes, especially because of the ability of RCA tubes to perform satisfactorily even under the extremely rigorous conditions so frequently imposed on electron tubes in export service. It was largely due to this fact that RCA was able to obtain and hold a preeminent position wherever American radio tubes are exported. Because of the renown of its tubes, RCA quickly became, at the outset of World War II, the preferred American supplier to the allied governments, with whom it was RCA's privilege to work out many of the technical military problems in electronics.

At the present time, RCA Victor has wholly owned subsidiaries in Canada, Mexico, Brazil, Argentina, England and Australia, and has a controlling interest in subsidiaries in Chile and India, as well as a minority interest in two companies in enemy-held territory in China. RCA also has a minority interest in a second company in Australia, and through R.C.A. Communications, Inc., has wholly owned communication companies in Cuba, Puerto Rico and Haiti; also, minority interests in communication companies in Argentina, Brazil and Chile.

RCA's international business has grown steadily throughout the years. Our company has established an excellent foundation upon which our international future can be built with confidence.

# SERVICE IS THE KEYNOTE

*Widespread Use of Radio and Electronic Equipment in Homes, Theatres and Industry Necessitates a Corps of Expert Technicians and Field Engineers to Keep the Machine in Peak Performance.*



By W. L. Jones

*Vice-President & General Manager, RCA Service Company, Inc.*

FROM the moment the first piece of apparatus bearing the RCA name came off the assembly line, RCA assumed a two-fold responsibility. The first was that this apparatus would work properly upon installation, and second, that it would serve a long and useful life. Out of this basic responsibility of satisfying the customer, RCA's service activities were born.

Since those early pioneer days, RCA's service responsibilities have grown to encompass not only every type of home radio receiver, but every type of radio, sound, or other electronic apparatus bearing the RCA trademark.

Came 1928, and Al Jolson in "The Jazz Singer". The "Talkies" revolutionized the motion picture industry, by adding sound to sight.

Sound motion pictures were to have a profound affect on RCA service operations. Thousands of theatres were to be equipped with special sound apparatus which required personnel skilled in its construction, installation and operation.

Contract service to theatres was inaugurated, and it was to mean the building of a unique company department, a manufacturers' service organization which, while backing RCA products in the field, was also a commercial enterprise in its own right. Through the years this service to theatres grew steadily, and at the outbreak of World War II, there were more than 3,000 signed for RCA Service.

### *Start New Service*

During the latter part of the 1930's, another service was inaugurated which was to greatly influence service operations during the coming war. The RCA television exhibit at the World's Fair, and the merchandising of television receivers in the New York metropolitan area, brought a new demand for technical men skilled in ultra-high frequency work. Thus was formed, together with theatre service engineers, the nucleus of a world-wide force which was later to be foremost in recognition by the Navy for its work on radar and other electronic equipment.

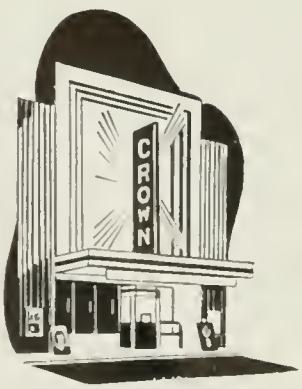
Long before Pearl Harbor, it was recognized that our fundamental duties would become twofold. The first was to meet the needs of the Armed Forces for trained personnel to install and maintain military electronic equipment, and the second to meet increased domestic service demands because of loss of operating personnel to the military, and the growing scarcity of replacement equipment.

### *Service Is World-Wide*

In the two and one half years since Pearl Harbor, volumes could be written about the experiences of the Government Service Group. A world chart shows that they now cover practically the entire globe on every major battlefront.

Other home front fields have developed rapidly. Contract service was introduced two years ago on paging and music systems in industrial plants. Today, a number of important war production units, such as Wright Aeronautical, Bendix, Grumman, Arma, and many others depend on RCA Service to keep their plant broadcasting systems in good operating condition. The Boston, Brooklyn, Philadelphia, and Charleston Navy Yards are also included in our list of sound service customers.

RCA Service Company, Inc., was formed as a separate RCA subsidiary early in 1943 for the more efficient handling of the technical servicing and installation activities




THEATER SOUND



HOME TELEVISION



INDUSTRIAL SOUND



ELECTRONIC HEAT

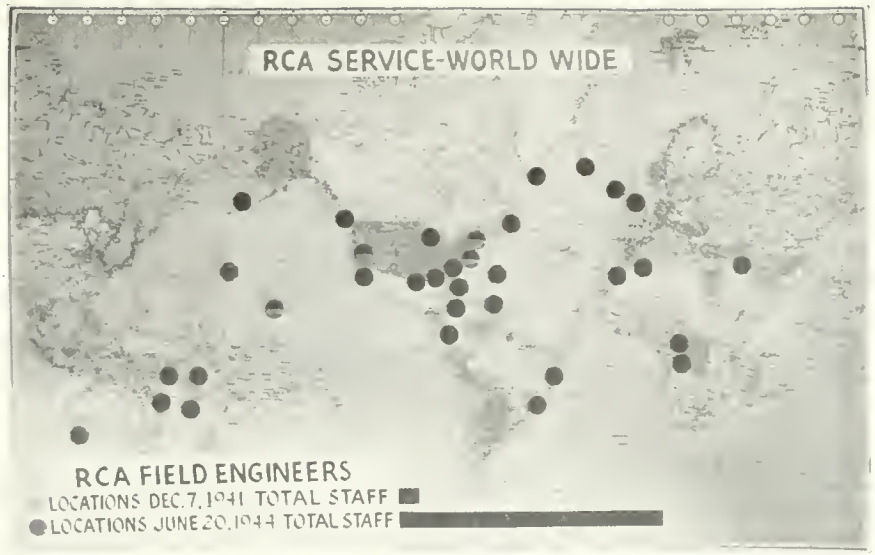
of the RCA Victor Division. Today there are nearly 400 employees engaged in the business of providing RCA Service.

To peer into the future is always hazardous. However, RCA Service is planning for continued steady growth in the coming years.

### *Service Needs Expand*

We see contract service not only for theatre sound, but for theatre television. We see the coming need for skilled service personnel when home television makes its bow after the war. Beginning in Eastern Metropolitan areas, service needs will naturally expand as television broadcast links are added. More men will be required as the network develops South and West. At the same time, there will be millions of new radios purchased, and field educational programs for distributors and dealers will continue as in the past. We see rapidly increasing service demands in the near future in the industrial electronic heat field. The potential requirement for both equipment and service in the Industrial Sound field are tremendous. And when you stop to think of the Electron Microscope, 16 MM film machines, police, aviation, and other communications equipment, Beverage Inspection machines, facsimile, broadcast and television transmitters, and so on —well, just let your imagination carry on.

But, whether the future sees a wrist model of a personal radio, or a 1,000 KW transmitter, RCA Service will be ready and able to handle it efficiently and promptly.




THE DOTS ON THIS MAP OF THE WORLD SHOW HOW FIELD ENGINEERS OF RCA SERVICE HAVE EXTENDED THEIR WORK INTO THE MAJOR THEATERS OF BATTLE.

## WEAF-FM On Display

Using newly assigned call letters WEAF-FM, the National Broadcasting Company's frequency modulation station in New York began 7-day-a-week operations on Sepember 24. The station will transmit network programs only, from 3 to 11 p.m., daily.

The transmitter, located in the Empire State Building, has been operating since 1939 on an experimental basis with call letters of W2XWG.

Sponsored programs falling within the period of WEAF-FM's operating time will be carried complete with commercials without an added service charge. This dual service plan was proposed earlier this year in a statement issued by Niles Trammell, NBC President, who said:

"Recognizing that cooperation with advertisers is necessary to ensure a sound economic foundation for frequency modulation, NBC proposes that no additional charge be made to advertisers for the use of Companion FM stations during their developmental period. The rate of the standard band stations and the FM stations will be established on the premise that it is a single service, for one charge until such time as the combined total audience of both standard band and FM stations increases to a point where rate adjustments become desirable."



RADIO BROADCAST



BATTLE ANNOUNCE




UNDER WATER SOUND



RADAR

# AWARDED LEGION OF MERIT





FOR "exceptionally meritorious conduct in the performance of outstanding services," Dr. David Sarnoff, President of the Radio Corporation of America, was last week awarded the Legion of Merit Medal at ceremonies held in the Office of the SECRETARY OF WAR.

In citing Mr. Sarnoff for the award, Secretary of War Stimson said: "Through the Radio Corporation of America and its subsidiary, the National Broadcasting Company, Mr. Sarnoff has made available to the Government the facilities of the world's largest broadcasting system. Under his direction, the Radio Corporation of America has developed and manufactured for the Army and Navy radio communications equipment of the highest quality in large quantities and with great speed. Throughout the war, Mr. Sarnoff has given unsparingly of his time and energy to the solution of the many problems which have arisen in connection with the development and production of military radio equipment. His services have been of great value to the War Department."

THE Legion of Merit Medal, for "exceptionally meritorious conduct in the performance of outstanding services," was awarded to Lieut. Col. Thompson E. Mitchell, Vice President and General Manager, Blue Communications, Inc., on October 16. The award was for the period July, 1943 to July, 1944, and is noted in announcements released by officials of the Executive Branch of the Government in charge of the Army Operations Planning Section of the Army Communications Service, Washington, D. C.

The citation in part read:

"For exceptionally meritorious conduct and ability for unsurpassed [illegible] in positions of [illegible] responsibility [illegible] Lieutenant Colonel [illegible] Army Communications Service [illegible] Washington, D. C. [illegible] [illegible] [illegible]

# Science Urged As Aid to Peace

They developed this new system, which consists of a spherical front mirror and an aspherical lens. The mirror looks like a shallow bowl, and the lens is flat on one side, with the opposite side having a special surface contour. The mirror arrangement resembles the one astronomers have used for many years to view the solar system.

The projection system is mounted near the floor of the receiver cabinet, and it projects the image straight up onto a flat mirror inclined at 45 degrees to the incoming beam of light. The mirror throws the image onto a translucent screen which is built into the front of the cabinet. The arrangement presents the advantages of compactness, and a cabinet need not be larger than the present floor model radio console.

*Relaying by Radio*

C. W. Hansell, Research Division Head of Radio Transmission at RCA Laboratories, read a paper on "Radio Relay Systems". He reviewed briefly twenty years of RCA radio relay system development which resulted in 1940 in the demonstration of a system for automatic relaying of the present standard television. The system operated on frequencies of 450 to 500 megacycles, used frequency modulation with amplitude limiting in repeaters, and included a repeater retransmitting the waves on the same frequency as they were received.

The requirements and problems of relay system designs were told by Mr. Hansell, who provided formulas based on reasonable assumptions for calculating required repeater gain, output power and antenna heights for various spacings between repeaters and various operating frequencies. Preliminary analysis indicates that repeater spacings of 35 to 45 miles should result in minimum overall operating costs, for systems which might be set up soon after the war.

A striking characteristic of radio relay systems is that the space circuits are more efficient conveyors of power than existing coaxial cables when both are required to accommodate present and future television modulation band widths. Television radio relay systems require much less repeater gain than the cable relay systems.

The high frequencies and great antenna directivities which will be used for radio relays, designed to handle television and other new services, make it possible to use each frequency band over and over again not only in geographically separated areas but, with some limitations, for circuits in and out of the same city. This efficient use justifies generous frequency band assignments to radio relay systems and holds the promise that radio relay networks will provide a new national public service.

A high degree of freedom from noise and from interference from undesired stations in the reception of FM radio programs is made possible by a new advance in the design of FM receivers. It was described at the conference by its inventor, George L. Beers, RCA Victor engineer.

Mr. Beers told of an FM receiving system in which a continuously operating local oscillator is frequency-modulated by the received signal. This represents a new approach to the problem. A substantial selectivity improvement has been obtained in the new system by designing the oscillator to lock-in only with frequency variations occurring within the desired channel.

Another important feature of the Beers system is a material improvement in the stability of the receiver from the standpoint of overall feedback. This results from the fact that the locked-in oscillator arrangement provides a substantial voltage gain at a different and lower frequency than the intermediate frequency employed in the receiver.

Improvements in the heat treating of metal products made possible by the use of electronic power concentrations up to 20,000,000 watts per cubic inch were described at the conference by Dr. Wesley M. Roberds, development engineer of the RCA Victor Division.

Among the advantages of such concentrations for heat-processing, he said, are product quality improvements growing out of closer control and more uniform effects. Additional advantages include increased production resulting from savings in process time, greater heating efficiency, and greater convenience.

"When intense heat concentrations are mentioned," he said, "one immediately thinks of the oxy-acetylene flame or the electric arc. In the case of the torch, the transfer efficiency from source to work is extremely low, so that heating equivalent to that produced by an electrical power concentration in the work of 5 kilowatts per square inch is about the maximum attainable at present. In electronic induction heating it is not difficult to put 100 kilowatts into a square inch of surface area with an overall efficiency of 50 per cent."

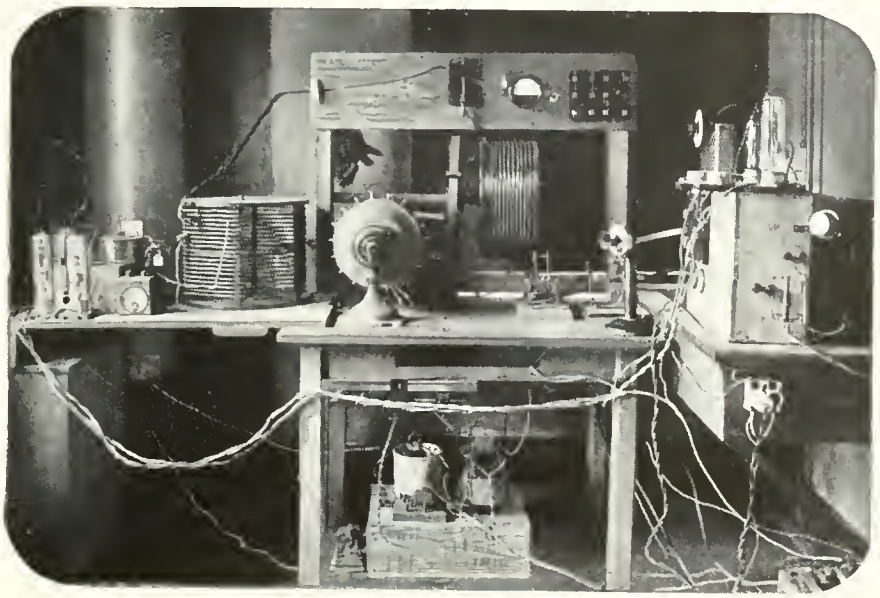
## 30 Million Showrooms

Offering 30,000,000 showrooms in the home—as compared to the 1,770,000 retail showrooms used to display the nation's prewar merchandise—television can be one of the most powerful forces in expanding postwar business to the degree that is necessary to advance America's economic welfare during the postwar era.

This prediction was made by Thomas F. Joyce, of the RCA Victor Division, in an address on October 17, before the annual Boston Conference on Distribution. It is based upon Mr. Joyce's estimate that by 1955, 30,000,000 homes will be equipped with television receivers with which to see merchandise as well as hear it described.

"A strong, nation-wide consumer demand is a necessary requisite to full production," Mr. Joyce said in prefacing his analysis of television's part in future American business. "We need to arouse the spirit of the people, and their will to do, if we are to generate more wealth in the form of goods and service. Television is the most powerful force on the horizon for setting into motion this kind of static wealth. In order to provide full employment during the postwar period without the use of extensive 'made' work projects, production and consumption of consumer goods must be increased a minimum of 50 percent over the prewar peak."

# A PIONEER THEN...

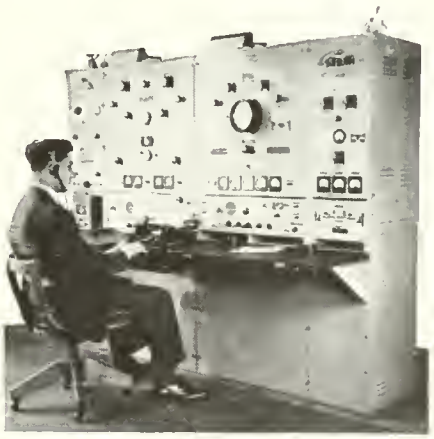


# A LEADER NOW!

Twenty-five years ago, RCA was an outstanding pioneer in the field of marine radio communications.

As RCA entered new fields it entrusted to Radiomarine this important work. Over the years Radiomarine has established itself as the leader in providing the marine world with the finest in radio equipment in ship-to-shore and shore-to-ship communication services.

Today Radiomarine looks forward to the leading pioneer role it will once more play—this time in the coming Electronic Age.



*Now—a ship-radio station in one unit*

## RADIOMARINE
## CORPORATION OF AMERICA

A SERVICE OF RADIO CORPORATION OF AMERICA

# *trail blazings

The National Broadcasting Company was formed in 1926. It was the *nation's first radio network*. Today it is America's number one network in programming, in facilities and in its service to the American people.

Indicative of the reasons "why", are the following excerpts from the NBC log. Commonplace today, these broadcasts were startling innovations in the radio broadcasting picture when they appeared *first on NBC* —

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**The broadcast on January 1, 1927 of the historic Annual Tournament of Roses Football Game at Pasadena . . .*

**FIRST** broadcast to the Eastern Seaboard of an event originating on the Pacific Coast.

**The broadcast of one act of "Faust" from the stage of the Chicago Civic Auditorium on January 21, 1927 . . .*

**FIRST** Opera transmission on any network.

**The symphony concert short-waved to America from Queen's Hall in England, February 1, 1929 . . .*

**FIRST** scheduled international program.

**The Christmas broadcast from America to Holland and England, December 25, 1929 . . .*

**FIRST** short-wave program beamed abroad.

**The December 25, 1931 broadcast of "Hansel and Gretel" direct from New York's Metropolitan Opera House . . .*

**FIRST** of a regular series of Grand Operas broadcast in their entirety.

**The establishment of the NBC Symphony Orchestra November 13, 1937 with Arturo Toscanini as conductor . . .*

**FIRST** full Symphony Orchestra to be devoted exclusively to broadcasting.

**The telecast by NBC television station WNBT of the opening day ceremonies direct from the World's Fair Grounds, April 30, 1939 . . .*

**FIRST** public television broadcast in the United States which inaugurated the first regular high-definition television service in America.

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These milestones are significant of NBC's consistent pace-setting record in the broadcasting industry. They are examples of a pioneering spirit worthy of NBC's pioneering parent company—Radio Corporation of America—leader for a quarter century in every phase of radio and electronic research and development.

**National Broadcasting Company**

**America's No. 1 Network**




A Service of Radio Corporation of America



# "THE MUSIC AMERICA LOVES BEST"



LOUIS CALHERN, star of more than 50 plays and motion pictures . . . master of ceremonies

## *RCA's great program over NBC Network keeps old friends and makes new ones*

To millions, RCA's "The Music America Loves Best" has become a high spot on their radio dials. In addition to featuring America's best-loved music, it presents the world's greatest artists . . . names as familiar as the music itself.

Each week it keeps and makes friends for RCA—friends we shall be glad to have when peacetime production is resumed. This is your program too. Tune it in every Sunday at 4:30 p.m., EWT, over NBC.



JAY BLACKTON, conductor of the RCA-Victor Orchestra and Chorus

**A Few of the Stars Who Have Appeared**



PERRY COMO



ALLAN JONES



JEANETTE MACDONALD



GRACE MOORE



ARTUR RUBINSTEIN



GLADYS SWARTHOUT

RCA

1919 1944

25 YEARS OF PROGRESS IN RADIO AND ELECTRONICS

## RADIO CORPORATION OF AMERICA

**RCA Victor Division, Camden, N. J.**

LEADS THE WAY...*in Radio...Television...Tubes...Phonographs...Records...Electronics*




# 25 Years that Created a New World of Radio 1919-1944

From 1919 to 1944 . . . RCA has pioneered in the science of radio and electronics . . . from world-wide wireless to national network and international short-wave broadcasting . . . from electron tubes to electron microscopes and radiothermics . . . from the hand-wound Victrola to the automatic radio-phonograph . . . from television to radar.

Twenty-five years of service to the nation and the public have made RCA a symbol of achievement and progress . . . RCA is a monogram of quality in radio-electronic instruments and dependability in communications throughout the world.

From the First World War to the Second, RCA developed and expanded its "know-how" in skilled engineering and production so vitally needed to meet the demands of war . . . these qualities will be reflected in the peacetime products of RCA.

## RADIO CORPORATION OF AMERICA

30 ROCKEFELLER PLAZA, NEW YORK CITY

*RCA LEADS THE WAY . . In Radio . . Television . . Phonographs . . Records . . Tubes . Electronics*

RCA
1919 1944
25 YEARS OF PROGRESS IN RADIO AND ELECTRONICS

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Public Library
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# RADIO AGE

RESEARCH · MANUFACTURING · COMMUNICATIONS · BROADCASTING

v. 8- nos 1-2



RCA

JANUARY 1945

# Visibility Zero...

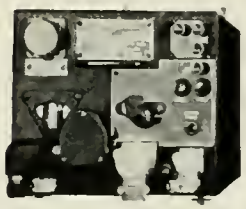
# Mission Accomplished...

# Communications Completed...





RCA Aviation Radio Transmitter
used in the PBY Catalina



RCA Aviation Radio Receiver used
in the PBY Catalina

THE PBY Catalina has become a synonym for reliability—long staying power—the ability to go anywhere, in any weather—to accomplish the most difficult and lonely missions—and to come back!

Flying with the Catalina on thousands of these missions, RCA Transmitters and Receivers have established their own record for reliability, for staying power, and for the ability to "get through."

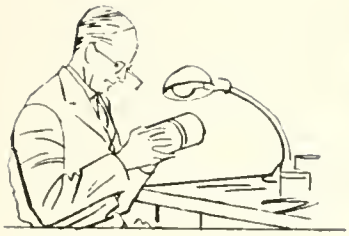
The good engineering, the quality construction, that make RCA Aviation Radio reliable when life and the successful accomplishment of war objectives are at stake, will serve aircraft manufacturers, the air transport industry, and the American flying public equally well after the war.

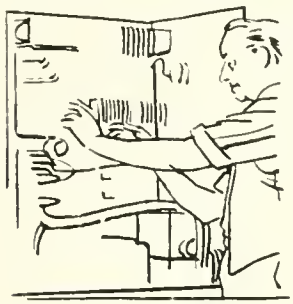
RCA

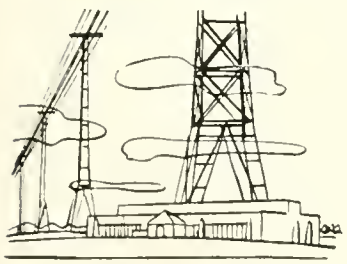
RADIO CORPORATION
OF AMERICA

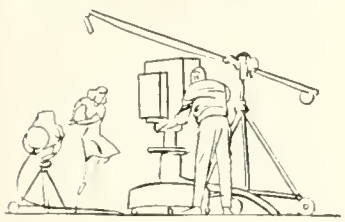
RCA VICTOR DIVISION • CAMDEN, N. J.

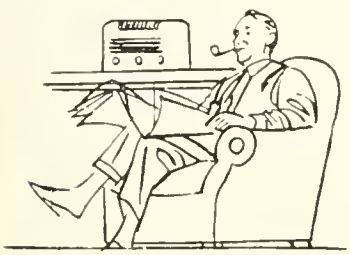
BUY MORE WAR BONDS











COVER — This family group is looking at black-and-white images on a projection-type home television receiver, developed experimentally by RCA.


# RADIO AGE

RESEARCH · MANUFACTURING · COMMUNICATIONS · BROADCASTING

VOLUME 4 NUMBER 2
JANUARY 1945


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THE WHITE HOUSE
WASHINGTON

October 12, 1944

Dear Colonel Sarnoff:

Events occurring in the world today remind me that it was twenty-five years ago -- while the soldiers were returning from the First World War -- that the Radio Corporation of America was formed. I remember well that officials of the Navy Department urged the organization of an American radio communication company so that this country would not again be dependent upon foreign companies for communication with other parts of the world.

During these twenty-five years your company has played an important part in achieving pre-eminence of the United States in radio. I congratulate you personally for splendid leadership. Your organization throughout the years has created new wonders and brought into being new services in all phases of radio activity for the benefit of the American people and for people everywhere.

I wish you and all members of the RCA family continued success in pioneering. With television as a new postwar industry of great promise in the fields of employment, entertainment and education, I know that under your guidance and vision RCA will continue to contribute to the economic and cultural values created by radio.

May the next twenty-five years see your fondest dreams in the fascinating world of radio come true.

Very sincerely yours,

Franklin D. Roosevelt

Colonel David Sarnoff,
President,
Radio Corporation of America,
30 Rockefeller Plaza,
New York, N. Y.

# New Era in Radio Communications

*GENERAL SARNOFF SAYS PERIOD OF CONTROL AT A DISTANCE IS OPENING—REVEALS THAT SCIENCE HAS GIVEN ELECTRONIC FINGERS WITH A SENSE OF TOUCH TO HANDS OF RADIO*



By Brig. General David Sarnoff
*President,*
*Radio Corporation of America*

IN 1944, radio performed services believed impossible in 1940. In meeting the challenges of war, science has given electronic fingers with a sense of touch to the hands of radio communication. A new era in communications is opening —the era of control at a distance.

Television enables us to see action at a distance. After the war by the use of television techniques we shall be able to reach out and operate many of these actions that we see. Just as human fingers press buttons and triggers, snap switches, and release energy to make wheels turn or control machines and vehicles, now radio-electronic fingers touch off new magic.

### *Science in Modern Warfare*

Man has long dreamed of using radio to start, steer, control and operate aircraft, tanks, torpedoes, automobiles, boats, and other objects. With uncanny manipulation of electronics, wartime research has made some of these dreams come true. Man has achieved radio control over wheels, rudders, wings and guns. Rockets no longer move only as phantoms of the imagination.

Already hundreds of radio-electronic devices are used in industry and many more will be available in the post-war period. They regulate the speed of machinery, measure the velocity of projectiles, level elevators, analyze and match colors, sort products, control lighting, create heat, hold materials in exact position during manufacturing processes, and skillfully perform a long list of other tasks. Electronics is a master of accuracy, speed, and efficiency. The electron tube brings a new meaning to the word "automatic" in mechanical and electrical operations.

The year 1944 will be remembered in the annals of radio as one in which much of future research and engineering was moved into the present. It was the year in which science—perverted for destruction by the enemy—was turned against those who used it for ruthless aggression. The impact on the enemy has been terrific; science has paralyzed his wings, sunk his submarines, blown up his ships, plummeted his planes and ripped his armor asunder.

### *Radio in Every Offensive*

Radio in modern warfare is a powerful force in every offensive, at every spearhead of advance, at every beachhead, and on every bombing mission. On every invasion, radio has helped to tighten the global pincers on the enemy. D-Day, June 6, 1944, revealed as no other day in the history of broadcasting, the world-wide service of radio in delivering news at the very instant it happens. People everywhere were listening, for the fate of civilization was at stake.

Radio covered the English Channel and gave the victorious invaders of "Fortress Europe" an "umbrella" of communication and protection that enabled coordination of the battle forces as they swarmed

RADIO OPERATOR ABOARD A NAVY CATALINA "BLACK CAT" BOMBER TUNES THE INSTRUMENTS DURING A NIGHT MISSION OVER THE PACIFIC.







LEFT—ANTENNAS OF THEIR PORTABLE RADIOS RISING FROM SHALLOW FOXHOLES DUG IN THE BEACH AT SAIPAN, MARINES OF THE FIRST LANDING WAVE SET UP COMMUNICATIONS. RIGHT—THESE U. S. COAST GUARDSMEN OPERATING SHIP-TO-SHORE RADIO EQUIPMENT PARTICIPATED IN THE INVASION OF SOUTHERN FRANCE.

across the waters and up the beaches of Normandy. It was radio that helped to shrink the vast distances of the South Pacific as the fleet and the airforce cleared the way to the Philippines and pointed toward Japan.

### *New Services to Come*

Today, only mention can be made of the magic term radar. It is, however, only one of the great wartime developments of science. When we see radiophotos in the news of Japanese battleships afire from stem to stern under direct hits by 1000-pound bombs, we may wonder what part radio had in the triumph. When we read of fighter-bombers dropping 500-pound bombs on industrial centers of the enemy, and accurately hitting their targets, we may wonder again what part radio played in the invisible yet accurate thrusts.

When peace comes it will find, as it has at the end of every war, new inventions awaiting to be applied to every-day life, to bring new services of safety and comfort, entertainment and education.

The outstanding developments in RCA Laboratories during 1944 were devices for the armed services. There are a number of developments, however, not on the secret list.

For example, a 300-megacycle television transmitter, the first of its kind developed to use 5-kilowatts of power for television broadcasting. Primarily, the development of a special electron tube and associated circuits made it possible. Its full use must await the end of the war; caged in a great wire-mesh at RCA Laboratories the engineers are studying the transmitter's performance and perfecting it for the future. Field tests are scheduled early in 1945 in the New York area.

Outside the activity of telegraphic or voice communication the RCA electron microscope has won great renown in science and industry. It may appropriately be classified in the visual branch of communication for it sees deeply into the submicroscopic world and thus "communicates" new intelligence to explorers in the realm of the infinitesimal, which heretofore has been hidden from the eyes of man.

### *Microbes Seen Electronically*

Bacteria, invisible or mere pinpoints under the most powerful optical microscope, when viewed under the electron microscope look like great shell holes as seen in reconnaisance photographs. In fact, microbes, which heretofore always appeared as rounded specks now are seen in definite shapes, some angular, some snake-like, others round and elongated. The doctor looks at these micrographs or pictures, and in an instant recognizes the particular microbe, or virus.

### *Micro-Analyzer Refined*

The micro-analyzer, an offspring of the electron microscope, which makes it possible to determine the chemical elements constituting submicroscopic parts of bacteria and other tiny particles, was further refined in 1944. For example, it will quickly reveal whether any component of a microbe or specimen, contains iron, carbon or other elements.

More than 1,000 RCA engineers have been working on wartime research, development and production of radio-electronic equipment. Worldwide study of the radio spectrum, coupled with tireless efforts of the RCA research and engineering staffs to meet the impact of war, has enabled the engineers to acquire and to expand engineering and manufacturing "know-how." As a result, RCA is an "arsenal" of radio from which the military, naval and air forces are equipped with the finest and most efficient electronic apparatus in the world.

To achieve these goals, several hundred new types of electron tubes have been created during the war, many of them by RCA engineers. Constructing special tubes and new

apparatus of intricate design is a continuing process, the magnitude of which is seen in the fact that RCA has built more than 200 new electron tubes and more than 350 different types of apparatus since the beginning of the war. Previously none of these had been manufactured by anyone.

### *Developments Make History*

The RCA wartime record in production of new designs and diversified apparatus in the electronic communication field is history making. The items are many, and range from acorn-size tubes to powerful battleship transmitters, from submarine apparatus to aviation equipment, from tank receivers to radar and radiosonde, from magnetrons to cathode-ray oscilloscopes, from "lighthouse" tubes to beam-power amplifiers, from radio altimeters to underwater-sound instruments, from antennas to throat microphones, from aircraft to portable infantry equipment.

RCA's men of science are performing new magic with waves that pulse like the heart, while other waves flow through space as continuous streams of energy. Some of these waves are harnessed to function over limited ranges and on lines as straight as an arrow. Others are broadcast to the four corners of the earth.

In a new service known as radiothermics, radio waves are applied to generate heat. The applications of this radio-heat in accelerating wartime industrial processes indicate the new uses to which this invisible "fire" will be applied where heat is needed to weld, mold, bake, vulcanize, laminate, cook, case-harden, solder, glue, purify, and dehydrate materials. For example, one of the outstanding achievements in RCA Laboratories in 1944 was the development of a new all-electronic process for drying penicillin. The use of radio heat completed in 30 minutes a major phase of the dehydrating process which had required 24 hours by ordinary methods, thus making available large quantities of this wonder drug, and at less expense.

### *Boiled In A Vacuum*

The potency of penicillin is reduced if it is subjected to normal boiling temperatures. To avoid this condition it is boiled in a vacuum at RCA Laboratories at a pressure equivalent to that at an altitude of fourteen miles. A very low boiling temperature can thus be used. A new machine, under experimental development, is capable of drying 2,000 bottles of penicillin an hour, which is enough for one treatment each to 10,000 persons.

Years of television progress plus wartime research in electronics convince our engineers that an efficient and dependable nationwide television system can become practical as a post-war service. This conviction is further confirmed by years of wave-propagation investigations, field tests and practical operation of television broadcasting service by the National Broadcasting Company. Wartime developments of RCA and NBC will make it possible to launch television and frequency modulation, or FM broadcasting, as great, post-war industries, and to initiate network operations.

### *Telecast Army Films*

These new branches of the radio industry will serve the American public by bringing new dimensions and quality to entertainment, and add greatly to post-war employment. Indicative of the timeliness of television, the latest Signal Corps films of the war are being telecast by NBC's New York station WNBT.

Radio engineers estimate that a projection television receiver, including standard broadcasting and FM, can be built in the post-war period for less than $400, and that other television receivers, designed exclusively for picture and associated sound reception, will be available at prices within range of the average income.

The same efficiency and craftsmanship which have made the RCA





LEFT—IN THE HURTGEN FOREST OF GERMANY, A "HANDY-TALKIE" RADIO KEEPS THIS INFANTRY SQUAD LEADER IN TOUCH WITH HIS COMMANDING OFFICER. BELOW—AS AN INFANTRY PATROL MOVES TO TAKE THE TOWN OF LIBIN, IN BELGIUM, THE MAN ON THE FAR RIGHT TRANSMITS MESSAGES TO THE REAR WITH A "WALKIE-TALKIE" PACK RADIO OUTFIT.



DEVELOPED IN RCA LABORATORIES, AN EXPERIMENTAL 300 MEGACYCLE TELEVISION TRANSMITTER IS PREPARED BY R. D. KELL AND T. L. GOTTIER, RESEARCH SCIENTISTS, FOR EARLY FIELD TESTS.

monogram the trademark of fine products and dependable service, will be found in television. The characteristics of skilled engineering that give "personality" to an RCA radio-phonograph will bring life-like realism into television. Every RCA instrument, whether it be a radio set, television, FM, phonograph or all of these services in combination, will have behind it the leadership of RCA Laboratories—the foremost center of radio-electronic research in the world.

In this review of the wartime evolution of radio, we salute the devotion to duty, cooperative spirit and patriotic efforts of RCA's 40,000 men and women who established new records in science and industry during 1944. For their achievements in radio, these workers have been honored by the Government through the presentation of six Army-Navy "E" Flags with fourteen stars signifying continued excellence in accomplishment, together with a three-starred U. S. Maritime Pennant, and a Victory Fleet Flag.

### *7,850 in Armed Services*

At the opening of 1945 more than 7,850 RCA employees were in the armed services. Sixty-five of these brave men have given their lives for their country.

Many RCA engineers and officials have been called on special missions in science and communication; their successes have been recognized by citations from the War and Navy Departments. Three men of RCA have been awarded the Legion of Merit for "exceptionally meritorious conduct in performance of outstanding service" and for "conspicuous achievements of lasting benefit."

In 1944, the Radio Corporation of America passed the milestone of its first twenty-five years of leadership and service to the public.

Within this 25-year period more than 21,777,000 RCA radio and phonograph instruments have been put into use throughout the world.

Since 1930, RCA Victor has produced 294,000,000 phonograph discs performed by the world's great artists.

There are 1,000 broadcasting stations in the United States; 325 use RCA transmitters and hundreds of others use RCA studio equipment and electron tubes.

More than 2,000 industrial plants are equipped with RCA industrial sound systems; 6,000 theatres use RCA theatre-sound equipment.

RCA operates more than 50 direct radiotelegraph circuits between the United States and foreign countries; they handled more than 145,000,000 words during 1944, including 1,300,000 Expeditionary Force Messages to and from men and women in the armed services.

### *Victory Is Chief Task*

No ship on the Seven Seas need be out of touch with land, or with its home port; approximately 80 per cent of the American Merchant Marine is equipped with RCA apparatus.

More than 57,000,000 broadcast receivers are in use in the United States. America's No. 1 Network—operated by the NBC—comprises 149 stations from coast-to-coast, and brings the most popular programs and up-to-the-minute news to millions of homes.

Since 1930, RCA alone has sold more than 452,000,000 electron tubes; millions of them are in service in homes and on every fighting front.

RCA enters its second quarter century with virtually all facilities contributing to the winning of the war. The gigantic task is to continue unabated the drive to Victory.

HIDDEN IN THE ATTIC OF A WRECKED BUILDING "SOMEWHERE IN FRANCE", THESE SOLDIERS RADIO BACK INFORMATION ABOUT APPROACHING ENEMY AIRCRAFT.





BRIGADIER GENERAL DAVID SARNOFF, PRESIDENT OF RCA, SPEAKING AT COMPANY'S 25TH ANNIVERSARY DINNER DECEMBER 1.

# Anniversary Dinner

## GENERAL INGLES, ADMIRAL REDMAN, GENERAL SARNOFF SPEAK AT RCA 25th BIRTHDAY EVENT—CHARTER EMPLOYEES HONORED

IN a distinguished gathering marked by tributes to radio's wartime achievements and citations of radio's great advances during the last quarter of a century, the Radio Corporation of America held its twenty-fifth anniversary dinner at The Waldorf-Astoria in New York on December 1, 1944.

President Roosevelt sent a message to Brigadier General David Sarnoff, President of RCA, complimenting the Company for its important role in achieving the pre-eminence of the United States in radio. Addressing the assembly were Major General H. C. Ingles, Chief Signal Officer, United States Army; Rear Admiral Joseph R. Redman, Director of Naval Communications; General Sarnoff, and his son, Lieutenant Robert Sarnoff, U.S.N.R., who spoke in a surprise radio transmission from somewhere in the Pacific.

Guests of honor included fifty-four of RCA's sixty-two Charter Employees, to whom were presented engraved lifetime fountain pens as a token of recognition for their services. Among guests at the speakers' table were Owen D. Young, founder and first Chairman of the Board of RCA; Edward J. Nally, the first President of RCA; Will Hays, President of the Motion Picture Producers and Distributors of America, Inc.; Major General James A. Code, Assistant Chief Signal Officer, and Major General Frank E. Stoner, Chief of the Army Communication Service.

On the entertainment program were artists of the stage, opera and radio, among them Maestro Arturo Toscanini, Dr. Frank Black, Miss Gladys Swarthout, Lauritz Melchior, Hildegarde, the Bernard Brothers and members of the NBC Symphony Orchestra. Dr. James Rowland Angell, Public Service Counsellor of the National Broadcasting Company, was toastmaster, and Lowell Thomas was master of ceremonies. The grand ballroom of the Waldorf-Astoria was decorated with floral arrangements, banners and backdrops appropriately designed for the occasion.

Dr. Angell read the message from President Roosevelt which recalled that RCA's formation in 1919 followed suggestions by Navy officials that an American radio communication company be organized so that this country would never again be dependent on foreign companies for communication with other parts of the world.

"During these twenty-five years your company has played an important part in achieving pre-eminence for the United States in radio," the Presidential message continued. "I congratulate you personally for splendid leadership. Your organization throughout the years has created new wonders and brought into being new services in all phases of radio activity for the benefit of the American people and for people everywhere.

"I wish you and all members of the RCA family continued success in pioneering. With television as a new postwar industry of great promise in the fields of employment, entertainment and education, I know that under your guidance and vision RCA will continue to contribute to the economic and cultural values created by radio.

"May the next twenty-five years see your fondest dreams in the fascinating world of radio come true."

General Sarnoff, who returned recently after eight months of military service overseas, as Special consultant on Communications to SHAEF, declared that America's entire radio industry deserved high praise for record-breaking achievements in supplying the fighting forces of the United Nations with the finest radio-electronic instru-

MAJ. GEN. HARRY C. INGLES, CHIEF SIGNAL OFFICER, U. S. ARMY, CONGRATULATING THE MEN AND WOMEN OF RCA AT THE ANNIVERSARY DINNER.



ments of war—equipment so necessary to attain Victory in the increased tempo of battle on the far-flung fighting fronts.

In addressing the men and women of RCA, General Sarnoff said while the "all-powerful part radio is playing in the war cannot be told until hostilities are over," it violates no military secret to say that "Whether it be research, engineering, manufacturing, broadcasting, or communications, you are doing a magnificent job." He then announced approval by the Board of Directors of an RCA Retirement Plan (see story on page 11) providing pensions for life, for service prior to December 1, 1944, and life annuities for RCA employees based on equal contributions from the employees and the Company after that date.

General Sarnoff asked that the occasion of the anniversary be regarded as an observance rather than a celebration, saying: "Let us make it a tribute to radio men and women in the armed services, in communications and on the production lines. Only by Victory can we win the right to celebrate." He disclosed that sixty-five RCA employees have lost their lives in the war, and 7,835 others "have left our family circle to join millions in the Armed Forces who are driving toward Victory."

"It has been America's good fortune to encourage the development of radio in every field of its activity," he asserted. "As a result, this country had a great radio industry to convert to the production of instruments of war. The entire industry deserves high tribute for its record-breaking accomplishments in supplying the finest radio-electronic apparatus to the United Nations.

### *Salute to Amateurs*

"Ready to meet the impact of war, America had a world-wide communications system and a broadcasting system second to none. To operate these vastly expanded radio services, America had thousands of self-trained amateur and commercial operators who quickly enlisted. Today these young men are in the front lines of communication with the Signal Corps; they are in the Navy and Coast Guard, on warships, transports and aircraft while thousands of others are in the Merchant Marine. We salute the radio amateur as an effective contributor to America's wartime radio communications.

"The unprecedented part that broadcasting is playing in this war, in binding together the people of the United Nations, and in bringing in some light to countries darkened by dictatorships, can best be realized when one is in the very vortex of it. I found myself in such a spot on D-Day, June 6, 1944. At an undisclosed location in the United Kingdom, the news came in directly from the beaches of Normandy and that news was broadcast instantaneously to all the world.

"People ask me what about television in the war; what about facsimile and FM? What about radar? The answers are the secrets of war and only Victory can reveal them fully. We can be certain, however, that what we have learned through their use in war will help substantially to increase and expand the products and services of radio in peace. The future of radio is boundless.

"Tomorrow holds the promise of television and of many other new electronic wonders which will aid our economy, help maintain employment, and broaden our cultural enjoyment.

"Our fighting men—over there—are on the road to Victory. Those of you who are on the production line are soldiers, too. The men over there are depending upon you. I have seen what can be done with American equipment in the field. In action, it is a vital link to Victory. I have listened on foreign soil to radio as the Voice of Freedom. If you only knew what it means to the liberated people over there, and what it means to our soldiers who comb the air impatiently for news from home, for baseball and football scores and their favorite entertainers. Radio is their only means of reaching out across the sea, literally to feel the pulse of home. I have joined with them in the field, listening to America; I have flown across the oceans and knew what a safety factor radio can be up there in the darkness where enemy patrols may be lurk-



LEFT—AMONG GUESTS OF HONOR AT RCA 25TH ANNIVERSARY DINNER WERE, LEFT TO RIGHT, MAJ. GEN. FRANK E. STONER, MAJ. GEN. JAMES A. CODE, REAR ADMIRAL JOSEPH R. REDMAN, BRIG. GEN. DAVID SARNOFF, AND MAJ. GEN. HARRY C. INGLES. BELOW—EDWARD J. NALLY, FIRST PRESIDENT OF RCA, RECEIVES FOUNTAIN PEN FROM HANDS OF GENERAL CODE AND OWEN D. YOUNG.



ing. You never get away from radio, no matter where you go in this war."

General Sarnoff recalled that the Radio Corporation of America began operations twenty-five years ago with 457 employees and today more than 40,000 are on the pay roll, 55 per cent of whom are women.

"Our road ahead is marked by great responsibility and golden opportunity," General Sarnoff concluded. "The achievements of radio during the past twenty-five years will be greatly surpassed during the next twenty-five years. May you all be here to celebrate in peace, your Golden Jubilee."

RCA's wartime service to the Nation received high tribute from General Ingles. He said: "Men and women of RCA, workers, technicians, engineers and management, you may well be proud of your contribution to the war effort. Through your continuous research and development, you have added to the general fund of scientific knowledge. Through your energy, brains and sacrifice, you have greatly aided in furnishing American soldiers with the finest communication equipment in the world. Through you, I take this opportunity to pay tribute to the great role played by the electronics industry in this technical war.

"The Radio Corporation of America like the Signal Corps has pioneered in communications," General Ingles continued. "For two decades it has been among the foremost in the development of radio art. Since its organization, RCA has established a world-wide communication system that gives the United States pre-eminence in radio communications. RCA developments in communications, broadcasting, research, engineering and manufacturing have proved their value in this global war. Not only have they rendered tremendous service to the government but, through Lend-Lease, they have accomplished the same important mission for the governments with which we are allied in arms."

### *Commends Sarnoff*

General Ingles spoke of the close relationship of RCA and its associated companies with the Signal Corps and the Army, adding, "You have attached your President, Colonel David Sarnoff,* to the Signal Corps from time to time as occasion demanded. Colonel Sarnoff's exceptionally meritorious conduct in the performance of outstanding services has gained him the Legion of Merit award, a decoration which he richly deserved. I can add nothing to the citation given to him by the War Department, which said, in part: 'Colonel Sarnoff's outstanding devotion to duty, his courage and great diplomacy in handling French citizens have aided materially in overcoming great difficulties.' I can assure you that Colonel Sarnoff's work in Europe was only one instance of his services to the Signal Corps and to the Nation."

Admiral Redman called attention to the fact that today the United States Congress is studying the possibility of a merger of the American communications services in the international field.

"We are on the threshold of reorganization and this subject is vital to our future," he declared. "Just as it was necessary for us to take decisive action after World War I, so it is necessary that we prepare ourselves for the future after this conflict by putting into effect a well prepared and efficient plan of operation that will permit the United States to maintain and

* Promoted to Brigadier General December 6, 1944.

REAR ADMIRAL JOSEPH R. REDMAN, DIRECTOR OF NAVAL COMMUNICATIONS, RECALLS FORMATION OF RCA IN ADDRESSING 25TH ANNIVERSARY DINNER.



BELOW—AT ONE OF THE CHARTER EMPLOYEE TABLES, WILLIAM H. TAYLOR OF RCAC RECEIVES HIS FOUNTAIN PEN AS HENRY CHADWICK, LEFT, ALSO OF RCAC, AND HENRY J. SULLIVAN, RCA CONTROLLER, WATCH. RIGHT—GENERAL SARNOFF, PRESIDENT OF RCA; MR. NALLY, FIRST PRESIDENT, AND OWEN D. YOUNG, FIRST CHAIRMAN OF THE BOARD.





improve its position in the field of international communications. Such a plan must be founded upon correct basic principles in order to endure. One of these basic principles is that the overall interests of the United States must come first and that all other interests, including the operating companies, must be coordinated in order to achieve that objective."

Admiral Redman, complimenting those whose farsightedness brought RCA into being, reported that advances in radio communications had made valuable contributions to the conduct of Naval warfare, and, looking to the future, asserted: "I envisage a remarkably efficient and modern international communications system. I can see great central switchboards on which terminate various circuits, each circuit operating through filters dividing it into many channels for all classes of service. I believe the Radio Corporation of America is alert to these future problems, just as it always has been in the past and will not fail to retain its leadership in the international field of communications."

### *Sarnoff's Son Speaks*

The surprise of the evening came when the clear and vibrant voice of Lieutenant Robert Sarnoff, speaking from an undisclosed base in the Pacific, brought a special greeting and a report of what radio is doing to win the war in that theater of operations.

"The magnitude of the job that radio has done in this war and the many ways in which it has contributed directly to Victory will not be fully known until we are again at peace," he declared. "But I can assure you, from personal observation and experience, while in the Naval service, that it is a story to challenge the wildest fantasy.

"Radio is the eyes and ears and voice of the Navy. It searches out the enemy and having sighted him, it helps direct his destruction. It transmits vital orders and reports and in turn it listens for them. In the Pacific, distances are measured in terms of thousands of miles. Yet radio spans those miles in a mere fraction of a second. Without radio it would be impossible to move vast quantities of men and materiel with the high degree of efficiency which has become standard operating procedure with the United States Navy. Radio makes possible the effective employment of huge task forces of battleships, aircraft carriers, cruisers, submarines and smaller craft such as the world has never before seen. The recent disastrous defeats suffered by the Japanese Navy in the Second Battle of the Philippine Sea can be attributed in large measure to radio.

"I have seen RCA equipment in places where the influence of civilization had hardly been felt prior to this war . . . on islands that were not so long ago cannibalistic. And I have seen aboard our fighting ships everything from small tubes to large intricate machines that serve as the Navy's mechanical brain. And you at home in the factories and laboratories can rightfully feel that you have played a major part in this success story. For without the equipment which you and others like you are turning out day after day, and without the research constantly perfecting that equipment and creating new instruments, it would be impossible to fight a war of such scope and to defeat our enemies so thoroughly."

In concluding, Lieutenant Sarnoff said: "To all of you, from assembly line worker to the President of RCA, I send my congratulations and may you continue to earn the Navy's highly prized symbol, 'To All Hands, Well Done.' Goodbye and Good Luck from Lieutenant Robert Sarnoff in the Pacific."

## NBC Stations Lead In Listening Habits Poll

*Nationwide Survey Shows Network With Margin of 128% Over Nearest Competitor*

IN 1077 cities through the United States, National Broadcasting Company network stations lead their closest competitor in nighttime "most" listening by 128%, according to the first report from the 1944 Nationwide Survey of Listening Habits released January 10.

The report was made public at a luncheon meeting held at the Ritz-Carlton Hotel, at which Niles Trammell, president of NBC; Roy C. Witmer, NBC Vice-President in Charge of Sales; Charles P. Hammond, NBC director of advertising and promotion, and James H. Nelson, network sales promotion manager, were speakers. Attending the session were leading executives of advertising agencies, program sponsors, representatives of the press, the NBC Management Committee and the NBC Station Planning and Advisory Committee.

### *230,000 Families Polled*

An overall analysis of the survey, presented through slides, shows that in the 1077 cities having more than 10,000 population 57% of the radio families listen most to NBC, after 6:00 p.m., local time. These 1077 cities account for 16 million radio families, equivalent to 56% of the nation's total.

The survey reveals that in the nation's 14 largest cities, with populations of 500,000 or more, NBC leads all other networks; in the 37 cities with populations of 250,000 or more, NBC leads all other networks in 36; and in the 92 cities with populations of 100,000 or more, NBC leads all other networks in 81.

Covering all cities of 10,000 population or more in the United States, the survey polled 230,000 families, or one out of every 140 radio families in the country, representing radio families in every county in the country. Questions asked were: "What stations do you listen to regularly?" and "Which one of these stations do you listen to MOST?"

This first report of the 1944 Nationwide Survey of Listening Habits records listeners' answers to the selective question, "Which one of these stations do you listen to MOST—at night, after 6 P.M.?"

Summing up by cities, the report concludes that NBC leads by nearly 6 to 1 over the nearest network in the category, "listened to most at night." NBC leads all other networks in 860 of the 1077 polled.

# RCA Inaugurates Retirement Plan

*MORE THAN 85 PER CENT OF ELIGIBLE EMPLOYEES ENROLL FOR PARTICIPATION—BENEFITS INCLUDE PENSIONS AND ANNUITIES FOR LIFE — COMPANY MATCHES MEMBERS' CONTRIBUTIONS*

ENROLLMENT in Radio Corporation of America's new employee Retirement Plan, announced by Brig. Gen. David Sarnoff, President, at RCA's 25th Anniversary Dinner on December 1, totaled more than 85 per cent of all eligible employees at the year end, and was expected to go still higher, according to officials of the Company. The plan provides pensions and annuities for life to members.

In both Radiomarine Corporation of America and RCA Institutes, the enrollment was 100 per cent of eligible employees; in RCA Laboratories, it was 97 per cent; in the National Broadcasting Company, 90 per cent; in R.C.A. Communications, Inc., 90 per cent, and in the RCA Victor Division, 83 per cent. Final reports from some departments and divisions have not yet been received.

### *Participation Voluntary*

Membership in the plan, which became effective December 1, 1944, subject to approval by RCA stockholders and the U. S. Treasury Department, is open to all persons regularly employed by RCA and its domestic subsidiaries who have reached the age of 25 and have completed three years of service. Participation is voluntary.

Benefits, which are designed to supplement Social Security, normally start at age 65 and consist of:

1. The pension, which is to be financed entirely by the employer and amounts to ¾ of 1 per cent of the first $250 of the member's monthly earnings on November 30, 1944, plus 1¼ per cent of such earnings in excess of $250, for each year of continuous service prior to December 1, 1944, up to 20 years after excluding the first three years of service and any service rendered prior to age 25.

2. The contributory annuity, which depends upon the amount of combined contributions of the employee and the employer made at each age and the annuity rates then in effect. Each member will contribute 2 per cent of the first $35 of basic weekly earnings, plus 4 per cent of the next $25, plus 6 per cent of basic weekly earnings in excess of $60.

The Company contributes a like amount and the combined contributions will be used to purchase contributory annuities for each member.

The RCA Retirement Plan is designed to provide in typical cases of employees having long service, retirement benefits which, with Social Security payments, will approximate one-third to one-half pay.

Special provisions are made under the plan for optional retirement benefits, and benefits in case of death or other termination of service.

While a contributory annuity normally provides an income payable for life of the member, his beneficiary will receive the difference if, at his death, the annuity payments received by him have not equalled the amount of his own contributions plus interest to his retirement date. The pension normally provides an income for the life of the member only.

Optional annuity and pension benefits available under the plan are:

1. A joint and survivor annuity providing for reduced retirement benefit payments to the member during his lifetime and for the continuance of such payments after the member's death, in full or in one-half the amount received by the member, to a joint annuitant named by him for life.

2. An adjusted annuity for members who retire before age 65, providing larger payments until age 65 to take account of the fact that Social Security benefits do not begin until that age, and smaller payments afterwards.

In the event a member dies before retirement, his beneficiary receives the full amount he has contributed, with interest. The present interest rate, which is guaranteed for all contributions made before December 1, 1949, is 2 per cent compounded annually.

The plan also provides that upon termination of service, an employee may withdraw the amount of his own contributions with interest.

### *Paid-up Annuities*

If the employee does not withdraw his contributions upon termination of service after five years of contributory membership, according to the plan he will receive the paid-up annuity purchased by both his and the employer's contributions.

Should termination of service occur after ten years of contributory membership and after attainment of age 50, he will receive not only the paid-up annuity purchased by both his and the employer's contributions but also a right to any pension financed for him for service prior to December 1, 1944. The paid-up annuity or pension may commence any time after age 55.

The annuities will be purchased from The Equitable Life Assurance Society of the United States, under the terms of a Group Annuity Contract, and the pensions will be financed with J. P. Morgan & Company, Inc., as Trustee, under a Pension Trust Agreement.

Among those participating in the plan are employees of the Radio Corporation of America, including RCA Victor Division and RCA Laboratories; National Broadcasting Company, Inc.; R.C.A. Communications, Inc.; Radiomarine Corporation of America, and RCA Institutes, Inc.



IN NEW YORK, JOSE ITURBE, FAMED PIANO VIRTUOSO, LISTENS TO PLAYBACK OF HIS FIRST RED SEAL RECORDING AFTER BAN IS LIFTED. THE SELECTIONS WERE "ROOGIE WOOGIE ETUDE" AND "BLUES."

# MUSIC RECORDING RESUMES

*RCA Victor is First of Companies Affected to Get Back Into Production Following 27-Months' Ban — Many New Selections are Distributed.*

FOLLOWING a 27-months' ban, RCA Victor resumed the recording of instrumental music on November 12 after an agreement had been signed with James C. Petrillo, head of the American Federation of Musicians. Fewer than 18 hours later, the first instrumental popular music to be recorded by Victor in over two years was being waxed in RCA Victor's Manhattan studios. Several hours later, in the same studio, RCA Victor sound engineers were recording the first post-ban Red Seal record.

First to resume recording after the lifting of the ban, RCA Victor was also the first to put the new discs on sale. Just over 24 hours after the first recording session, copies of the disc were on sale in Philadelphia. Before the week was over, more than 160,000 copies of this new disc had been distributed to RCA Victor dealers throughout the country.

The first to record instrumental music for Victor after the signing of the agreement was orchestra leader Vaughn Monroe, whose band was readily available to the New York studios. His offering, recorded within a few hours after the ink was dry on the Petrillo contract, was "The Trolley Song," backed by "The Very Thought of You."

That same evening, Jose Iturbi, world famous pianist, became the first classical artist to record. On a 10-inch Red Seal disc, he performed two piano compositions by Morton Gould — "Boogie Woogie Etude" and "Blues." Mr. Iturbi went into the RCA Victor recording studio shortly after an appearance on the RCA "Music America Loves Best" radio program.

As word of the signing of the agreement with the AFM was flashed to RCA Victor recording centers in Hollywood and Chicago, where recording crews were standing by, the studios turned into beehives of activities. Pre-arranged plans which have long been awaiting the signal were immediately set into motion. Popular band leaders and

BELOW—IN NEW YORK, VAUGHN MONROE AND HIS ORCHESTRA PERFORM "THE TROLLEY SONG" BEFORE THE RCA VICTOR MICROPHONE, MAKING THE FIRST VICTOR INSTRUMENTAL MUSIC RECORDING IN 27 MONTHS. RIGHT—IN PHILADELPHIA, THE FOLLOWING DAY, "THE TROLLEY SONG" DISCS GO ON SALE.









ABOVE—IN CAMDEN, N. J., LEOPOLD STOKOWSKI, FAMED CONDUCTOR, GOES OVER A SCORE WITH AL PULLEY, RCA VICTOR'S CHIEF RECORDING ENGINEER, IN PREPARATION FOR NEW RECORDINGS WITH HIS OWN ORCHESTRA. RIGHT—IN CHICAGO, CHARLIE SPIVAK, WITH TRUMPET, MAKES HIS FIRST RECORDING UNDER THE VICTOR LABEL.

singers, with tunes already selected and arranged, hurried into the Victor recording studios as schedules permitted. They came from theatre stages, from swank hotel dance rooms, from night clubs and motion picture lots.

In the classical field, the world's greatest artists on Victor's roster—famed instrumental virtuosi, singers, orchestra conductors—also began to record as studio schedules and their own engagements permitted. To cities where larger recording groups were located, a crew of engineers rushed portable recording equipment.

To set a new industry record in recording - to - counter time, "masters" of the Vaughn Monroe cutting were rushed to Victor's Camden, N. J. plant from New York by special messenger. In Camden a special crew worked through the night to process the "masters" and turn out the first lot of discs that rolled off the presses and into a Philadelphia store the next afternoon.

Within six weeks after recording was resumed, Victor had released or was set to release 21 popular discs. Fifteen of RCA Victor's 20 active pop recording artists were recorded in this time and every tune on the Hit Parade had been covered.

With production of new discs made possible by the lifting of the recording ban, RCA Victor is again in position to supply both the home front and fighting front with new selections by the world's greatest artists. Efforts are being made to meet quickly the strong pent-up demand by the public for recordings by classical and popular artists, and the demand for recordings of hits introduced by radio and the stage during the war.

The resumption of recording, however, does not mean an increase in production of discs. While it offers the public fresh, new music, total output remains unaffected as the company is still confronted by the problems of manpower, machine, and packing material shortages.



IN HOLLYWOOD, TOMMY DORSEY, SEEN HERE WITH ONE OF HIS VOCALISTS, FREDDY STEWART, COMPLETES THE CROSS-COUNTRY PARADE OF NEW RCA VICTOR INSTRUMENTAL RECORDING SESSIONS.

## New NBC Transcriptions

NBC's Radio Recording Division resumed operations Monday, November 13, after a "vacation" of 27 months, caused by the Petrillo edict to members of the American Federation of Musicians. This order by the union president caused a suspension of virtually all recording activities in which musicians were required.

However, during that period of more than two years, NBC was able to supply transcriptions for its Thesaurus library subscribers using choral groups and a capella ensembles. It was possible to continue the Division's dozen or more recorded program series because the scripts were either talks, comments or straight dramas with sound effects.

When the ban was lifted, orchestras directed by Vincent Lopez and Sammy Kaye went into action immediately.

# WELCOME HOME AUDITIONS

*NBC Seeks Radio Talent Among Men and Women of Armed Services, Hoping to Aid in Rehabilitation Work—Network Stations Also Benefit.*



By C. L. Menser

*Vice President in Charge of Programs, National Broadcasting Company*

THE Welcome Home Auditions started with a very simple idea. Having heard hundreds of formal and informal discussions on the subject of rehabilitation and post-war plans, and having felt about these discussions much as Mark Twain felt about the weather—as something which everyone was talking about but no one doing very much about—I decided that NBC should contribute something practical.

It occurred to me there must be hundreds of men and women in the service with talents which post-war radio might use. Two things about these talents seemed fairly evident. One was that in many instances they were being developed during the period of service by performances and entertainments at camps, or by such informal items as playing the piano or singing in various service recreation quarters.

Entertainments which the service personnel provided for themselves were undoubtedly helping amateur "emcees" to get experience and the confidence and expertness which go with it; quartets or trios that started with impromptu "barbershop" harmonizing to develop more professional presentations; scrip writers to progress from very simple announcements to black-outs and comedy routines and dramatic scenes; in fact, all types of talent—announcers, actors, writers, performers — to improve their own latent abilities by using them in hundreds of camp entertainments.

The second evident fact was that no one in the radio industry seemed to be doing very much about finding out whether these talents were being developed or to what extent they might be used.

Both of these factors were emphasized by the general situation with respect to talent throughout the radio industry. It has long been my feeling that this was pretty haphazard, and that something should happen to make it more definite. It is true that most stations have some sort of audition system by which they hear and appraise the talents of those who request auditions. But in part because the industry has grown so rapidly, and in part because the need was not so apparent until the war took a great number of people away from radio, there has never been a definite system in the industry which would guarantee the greatest possible use of most of the available talent.

So it seemed perfectly natural that if we could make a start toward appraising the potential talent of service personnel, both men and women, and, having made that appraisal, acquaint all our stations with the results, we might be of great service to the stations and at the same time provide a practical answer to the returning soldier whose question is: "Where do we go from here?"

It was obviously necessary to get the official approval of all branches of the service. When they were acquainted with the purposes of the plan, their response was immediate and enthusiastic. They cooperated whole-heartedly in informing the men and women in the service as to how they might be auditioned. Notices were posted in camps and printed in service papers.

NBC made frequent announcement of the plan on the air. These announcements carried the simple facts that any man or woman now in the service or recently discharged from the service would be given an audition and interviewed, and that he might make application either in person or in writing.

We then set up a small unit to devote its entire time to these auditions. This unit was placed under the general supervision of George Maynard, Assistant Production Manager, assisted by Mrs. Kathryn Cole, whose husband and son are in the service, and Miss Jane Revels. These three persons form the nucleus of a larger group, which involves Miss Helen Korday and

FORMERLY AN AERIAL GUNNER IN THE ALEUTIANS, COWBOY SINGER WHITEY CARSON WAITS WITH OTHERS FOR HIS WELCOME HOME AUDITION AT NBC. HE WON THE FIRST PROFESSIONAL ASSIGNMENT RESULTING FROM THE AUDITIONS.





BOTH ENTHUSIASTIC OVER THE TALENT SO FAR REVEALED, NBC PRODUCER GEORGE MAYNARD (LEFT) AND NBC VICE PRESIDENT C. L. MENSER LISTEN IN THE CONTROL ROOM TO ONE OF THE SERVICE PERFORMERS.

others of the Personnel Department, and Sheldon Hickox and others of the Station Relations Department.

The plan involves two general aspects—one of collecting the information, and the other of disseminating that information. The first has to do with the audition proper. Each applicant is interviewed to learn his present status with respect to the service, his home town and his desire as to location when he is discharged, and is then given an audition to determine his ability. In the event that he is not so good in one line, an attempt is made to learn whether he has abilities along another line. His picture is taken and a recording is made of his voice so that his future employer may know what he looks like as well as what he sounds like. In the case of script writers, they may submit examples of their work. As many pertinent facts as possible are set down in connection with the applicant. He is given a card certifying that he has had an audition with NBC, so that when he gets back home he can go to his nearest NBC station and present this card to the program manager and be considered for a position.

When properly assembled, the data are turned over to the Personnel Department who, in conjunction with the Station Relations Department, make up a monthly report to be sent out to all of NBC's affiliated stations. The net result of this is that over a period of months every NBC affiliate will have accumulated a file of reports to which they can turn for confirmation when the applicant presents himself, or from which they can make inquiry when they come to fill vacancies.

Though the auditions have been in operation only a short time, stations have already made frequent inquiries about particular men or women whose records interest them. Many have asked for and received audition recordings, and a number of auditionees from among those recently discharged from the service have been given jobs.

From the point of view of the applicants, there is an apparent eagerness for these auditions which has far exceeded our expectations. The original plan was to assign three hours on Saturday morning on the assumption that many men in service on weekend passes might find Saturday a convenient time to audition. We have had to add a mid-week audition period, and current indications are that we may have to add yet a third. When we have worked the "bugs" out of the system, we hope to extend it to the other NBC Division Points, namely, Chicago and the West Coast, and possibly to all our owned and operated stations in Washington, Cleveland, Denver and San Francisco.

One particular point I should like to emphasize. It is that the title "Welcome Home Auditions" was chosen because it was my feeling that in addition to learning about the abilities of the service personnel, we should plan to integrate those abilities into the work of the stations in or near their home towns. One of the cardinal principles of the system is to decentralize talent. The effectiveness of the plan would be much less if it merely resulted in bringing a horde of radio performers into New York City. Many of the performers already in New York would be better off if they would make a place for themselves in some of the smaller stations. To professionals already in the field, this is a difficult point of view to get across. It is my hope that it will not be so difficult with those who plan to enter radio and would welcome positions in places where the competition is not so severe. The second thing is that I have no delusions about the size of the contribution this plan may make to the general problem of returning soldiers. It is, to be sure, only a minute bit. If, however, it should turn out that during the next two years NBC had heard some thousands of returning service men and women, and had helped them to determine whether or not they belonged in radio—and if so, where they might fit—both the network and its stations will have considered the plan successful.

## Iraq Awaits Television

The Arab of the Middle East looks forward to the return of free trade by which he may obtain American goods and products, according to Hafidh Al-Kadi, RCA Victor distributor in Iraq, and a member of the Iraq delegation which attended the recent International Business Conference at Rye, New York.

Sayid Hafidh, accompanied by the Iraq delegation, visited RCA Victor's headquarters at Camden, N. J., where they were received by Jay D. Cook, Managing Director of the company's International Department.

In his first-hand report on wartime conditions in Arabia, the RCA Victor distributor said that one of the developments of modern science in which the people of Iraq are most keenly interested is television.



RCA ELECTRON MICROSCOPES, LIKE THIS COMPACT DESK MODEL, ARE EXPECTED TO OPEN MANY NEW POSSIBILITIES FOR CIVILIAN APPLICATION EARLY IN THE POSTWAR YEARS.

# MICROSCOPE AIDS DENTISTRY

*RCA Electron Instrument Reveals Details of Teeth Never Seen Before—Society Elects Hillier President, Banca Secretary-Treasurer.*

ELECTRON microscopes developed by the Radio Corporation of America and now used extensively in the war effort have opened many new possibilities for civilian application after military pressure diminishes, according to papers presented at the November meeting of the Electron Microscope Society of America in Chicago. Attending the three-day conference were electron microscopists representing more than a score of leading college and industrial laboratories. Dr. James Hillier, of RCA Laboratories, Princeton, N. J. was elected President, and M. C. Banca, of the RCA Victor Division, was re-elected Secretary-Treasurer of the Society.

It was disclosed that the electron microscope, by means of which a tooth area one-tenth the width of a toothbrush bristle can be photographed and studied, holds far-reaching prospects for dentistry. Dr. C. H. Gerould, research engineer with the Dow Chemical Company, Midland, Mich., explained it this way: "It is as though the darkened laboratories of dental technicians suddenly were flooded with light. With the electron microscope, tooth structures whose very existence had been in doubt can be seen, measured and examined."

One of the examples cited by Dr. Gerould were tiny canals within teeth. Micrographs obtained with an RCA electron microscope, he said, revealed each human tooth to contain 50,000 miles of these canals, which no eye had ever seen. He showed pictures of a cross-section area of a tooth, magnified 5,300 times, in which the openings appeared as huge craters.

The increased knowledge of tooth structures and the greater opportunity for earlier detection of diseases of the teeth which the electron microscope has made possible should, in Dr. Gerould's opinion, help dental researchers in the further development of methods of tooth preservation.

"Preliminary work on tooth structures," he said, "has indicated that the electron microscope can be used successfully towards giving the dental research worker a new tool for application in his field."

The micrographs, shown by Dr. Gerould at the meeting, were all stereoscopic views, showing three dimensions. So exact is the operation, it was explained, that a magnified image can be adjusted to within one-sixteenth of an inch at 20,000 diameters. This corresponds to the actual movement of the specimen to an accuracy of three one-millionths of an inch. A square area 2 1000 of an inch on the side, when magnified 20,000 times, becomes 40 inches on a side. To complete a mosaic it would require 400 regular 2" x 2" micrographs and were these enlarged to 100,000 times, it would require photographic paper sufficient to cover an area one-quarter of an acre in size.

Perry C. Smith, Manager of the Electron Microscope Section of RCA, reported that thousands of micrographs had been made since August, 1941, when a special group was organized at the RCA Victor Division to handle advanced work, production and design of RCA's electron microscopes. He and his assistant, Dr. Robert G. Picard, described in a paper the two latest RCA electron microscopes. The models represented four years of intensive research and engineering by Dr. V. K. Zworykin, Associate Research Director of RCA Laboratories, Dr. Hillier and Mr. Smith. One of the instruments is a streamlined version of the electron microscope now being utilized in wartime research by large medical, industrial and university laboratories. The other is a console model for the nation's disease fighters, food processors and industrial research men working in smaller laboratories.

A revelation which attracted wide interest at the conference dealt with our future wearing apparel. Post-war pants may not bag at the knees so quickly or post-war shirts clutch so tightly at the neck; woolen sweaters may come out of the washer the same size as when they went in. These prospects came from studies made with the RCA electron microscope by D. H. Reynolds and J. A. Rich of the Monsanto Chemical Co., Dayton, Ohio.

These experts explained that the microscope permitted such detailed examination of the fibers of clothing materials that the effect on these materials of water and other substances could be accurately determined. It was found that treating the fibers with certain types of

resin increased their resistance so enormously that the problems of shrinkage and loss of shape were largely solved.

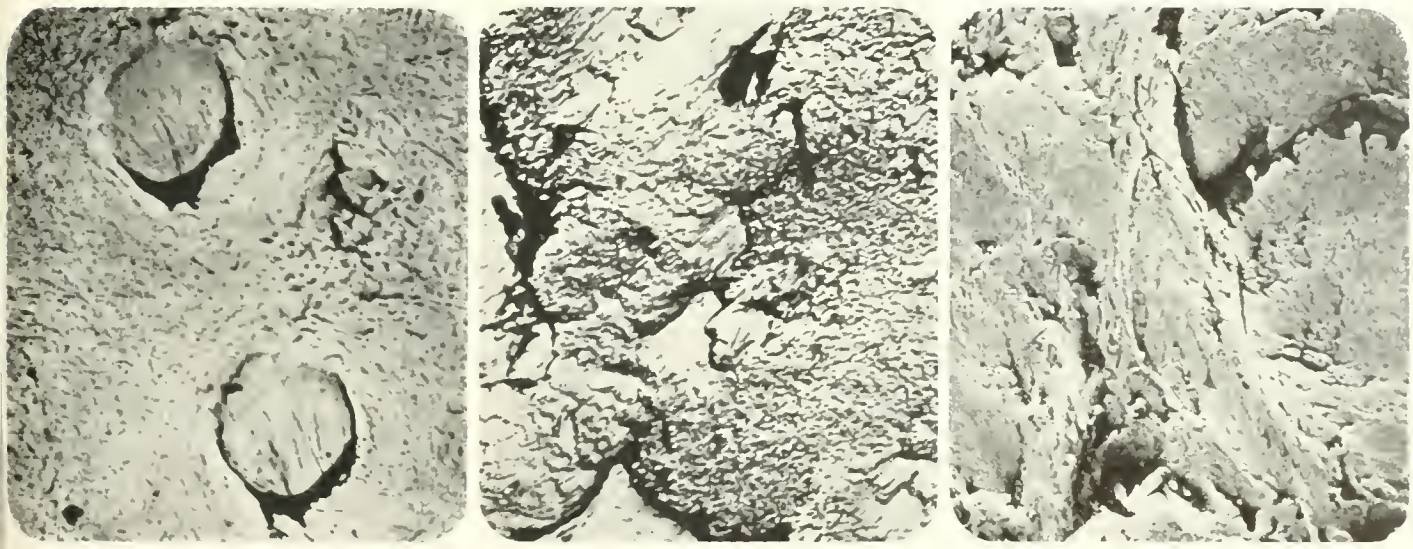
Plans are under way, it was indicated, for resin treatment of many types of clothing material after the war.

Among micrographs shown at the meeting was one of a surface which had been marked with 15,000 lines to the inch. In the picture, which had been enlarged thousands of diameters, the lines, invaluable for purposes of measurement, appeared one-quarter of an inch apart.

It was explained in another paper that natural rubber, when examined by means of the electron microscope, reveals the factors that early synthetic rubber lacked and which accounted for the natural product's greater durability and elasticity. This information has now been applied in the manufacture of synthetic rubber with satisfactory results, according to L. H. Willisford, Research Laboratories, the Goodyear Tire & Rubber Co., Akron, Ohio.

Heard at the meeting also were papers by L. H. Matheson and R. D. Heidenreich of the Dow Chemical Company; R. T. Phelps, A. L. Langer and Earl A. Gulbransen of Westinghouse Research Laboratories; Harold C. O'Brien, Jr. of St. Joseph Lead Co., Monaca, Pa.; John Turkevich, Department of Chemistry, Princeton University; Thomas F. Anderson, University of Pennsylvania; E. W. Schulta, P. R. Thomassen and L. Marton of Stanford University; Harry E. Morton of the Pennsylvania School of Medicine; L. O. Brockway of the University of Michigan; R. F. Baker and F. H. Nicoll of RCA Laboratories; L. S. Birks and H. Friedman of the U. S. Naval Research Laboratories, Washington, D. C., among others.

DETAILS OF HUMAN TEETH NEVER SEEN BEFORE ARE REVEALED IN THESE MICROGRAPHS MADE WITH AN RCA ELECTRON MICROSCOPE: LEFT—TRANSVERSE SECTION OF A NORMAL TOOTH SHOWING DENTINAL CANALS, APPROXIMATELY 50 MILES OF WHICH EXIST IN ONE TOOTH. CENTER—IRREGULARITIES OF STRUCTURE IN ENAMEL SURFACE. RIGHT—EXTERNAL CEMENTUM, OR COVERING, OF THE SURFACE OF THE ROOT.



# TELEVISION REPORTS VOTE

*November Presidential Election Returns Seen By Video Audiences in New York and Philadelphia—NBC Visualizes Results of Balloting.*

APPROXIMATELY 4,000 homes in New York City and suburbs, and 200 in Philadelphia knew the results of the November election ballotting seconds and sometimes minutes ahead of their neighbors equipped only with standard radio receivers. Television signals transmitted by the National Broadcasting Company from its station WNBT on the Empire State Building and relayed by WPTZ, Philadelphia, made possible the speedy service.

Nerve center of the television network was a small studio in Radio City, equipped with AP teletypes and an assortment of charts and other visual aids which provided viewers with an instantaneous record of the vote as it varied from minute to minute.

In the studio, banks of hundreds of lights made brilliant a scene of orderly confusion. Cameras shuttled back and forth on their rolling platforms trailing snaky coils of wire with them. Producers and directors wearing telephone head-sets that brought orders from the control booth high against the ceiling, signaled with waving hands, pointing fingers and cabalistic signs.

Moving in turn from a blackboard carrying last minute compilation of returns arranged by states to dual thermometers labelled "Roosevelt" and "Dewey" on which indicators were shifted constantly, cameras made it possible for viewers to see at a glance the progress of the contest.

# RADIOPHOTO IN ADVERTISING

*International Department of RCA Victor Plans to Use Service in Postwar Program of Global Advertising—Advantages Outlined.*

A POSTWAR program of global advertising which would utilize RCA Radiophoto to flash copy and layout for simultaneous release to publications throughout the world has been announced by the International Department of the RCA Victor Division of the Radio Corporation of America.

The new plan for speedy worldwide placing of advertisements will rely upon the transmission of copy by RCA Radiophoto to world capitals which are equipped with this type of communication. From these radiophoto centers, which are expected to be more numerous after the war, the advertisements will then travel by airmail to an additional network of far-flung cities, making possible the synchronized appearance of advertising copy in publications serving in widely separated world markets.

The practicability of this program has been demonstrated by RCA on two different occasions during the last year. The most recent use of radiophoto ad transmission occurred during the observance of RCA's 25th Anniversary, when an advertisement describing the company's pioneering contributions in the field of radio and electronics was speeded to publications in Europe, Australia, Africa, India and the Middle East. This advertisement was an adaptation of copy originated by the parent company and widely used in the anniversary campaign throughout the United States.

The copy, prepared by the J. Walter Thompson Agency of New York, was radioed to the Eastern Hemisphere by RCA Communications offices at New York and San Francisco as the first stage of transmission. As soon as the copy was received in London, Cairo, Stockholm, and Sydney, the distributing agency at each capital working with the local Thompson agency representative, arranged for publication in these centers. The copy was then rushed to other large cities by airmail.

From London the radioed copy was airmailed to Lisbon, Madrid, and Cape Town for distribution to Spanish, Portuguese, and South African publications. From Cairo the radiophoto was flown to Istanbul and Bombay for publications in North Africa, the Middle East, and India. Copy received at Stockholm was dispatched to Swedish publications. Sent from San Francisco to Sydney, the radiophoto advertisement went into production for other cities in Australia and New Zealand.

By the combined use of radiophoto and rapid airmail delivery, the RCA Anniversary advertisement was made available to 12,500,000 persons in 47 countries in a matter of hours and days instead of the weeks and months ordinarily required for this type of coverage. Transmitted in English, the advertisement was translated at the point of receipt and appeared in a total of 274 newspapers and magazines published in 18 different languages and dialects: Afrikaans, Arabic, Dutch, English, French, Portuguese, Spanish, Swedish, Turkish and nine Hindu dialects.

The anniversary advertisement as transmitted was prepared in four sizes, including one 14 inches, two columns by 7 inches, the size indicated by the Office of War Information as most acceptable for the countries in which RCA is cooperating with the OWI on advertising. The illustration which accompanied the international message depicted the symbol, RCA, in a striking sunburst.

Earlier in the year, RCA successfully used radiophoto transmission for an advertising campaign in connection with Motion Picture Academy Awards to RCA-recorded films. The day after the awards were announced in Hollywood, an RCA advertisement, carrying the names of the winning motion pictures and their principals, was transmitted by radiophoto to London, Cairo, Sydney, and Buenos Aires for relay by airmail to other countries.

This successful advertising use of the radiophoto method caps a twenty-year period of communications development by RCA. It was in 1924 that RCA first transmitted a photograph across the Atlantic by radio.

Experience gained in the combined use of radiophoto and airmail delivery of advertisements on the two recent occasions will be applied to campaigns to be conducted in many countries throughout the world after the war, it was stated by William J. Reilly, advertising manager for the RCA Victor International Department.

RCA Victor's postwar plan will include the international distribution of a selected line of household appliances in addition to the distribution of its own products to a wide market extending into 120 countries and territories.

## Star to Laboratories

A THIRD star for continued outstanding achievement in the war effort was awarded in December for addition to the Army-Navy "E" Flag won in 1943 by RCA Laboratories at Princeton, N. J., according to word received by O. S. Schairer, Vice President in Charge of the Laboratories. Notification of the award was made by Admiral C. C. Block, USN (Ret.), Chairman of the Navy Board for Production Awards.

RCA Laboratories' new award brings to nineteen the number of stars for continued outstanding achievement which have been added to the war production flags and pennants won by RCA divisions and subsidiaries. A summary of the awards follows:

RCA Laboratories — Army-Navy "E" flag and 3 stars.

RCA Victor Division — Army-Navy "E" flag and 4 stars to the Camden, New Jersey plant; "E" flag and 3 stars, Harrison, New Jersey plant; "E" flag and 2 stars, Indianapolis, Indiana plant; "E" flag and 1 star, Lancaster, Pennsylvania plant.

Radiomarine Corporation of America—Army-Navy "E" flag and 3 stars, Maritime "M" Pennant and 3 stars, and the Victory Fleet flag.

RCA Communications, Inc. has been awarded the Certificate of Appreciation by the U. S. Army Signal Corps.

# Sarnoff Receives Top TBA Award

RCA PRESIDENT, CALLED "FATHER OF AMERICAN TELEVISION," CITED AT CONFERENCE FOR INITIAL VISION AND LEADERSHIP — ZWORYKIN HONORED AS TECHNICAL PIONEER

*Called the "Father of American Television," Brig. Gen. David Sarnoff received the major citation among awards made by the Television Broadcasters Association, Inc., at the Association's First Annual Conference Dinner on December 12 at the Hotel Commodore in New York. The citations and medals "in recognition of those who have brought television to its present state of development," were presented by Paul Raibourn, Chairman of the TBA Committee on Awards. His remarks and General Sarnoff's response were transcribed as follows:*

MR. RAIBOURN: Now we come to a gentleman who long has had a vision. The Committee was certain that there were times when he did not feel so sure of his vision, but communing with himself he always decided that that vision was right.

He has lately been out of this country. He knows conditions throughout the world with respect to electronics and with respect to television and his citation is *for his initial vision of television as a social force and the steadfastness of his leadership in the face of natural and human obstacles in bringing television to its present state of perfection.*

The Committee wishes to call him *The Father of American Television.*

Gentlemen, I give you General David Sarnoff, on leave from the Presidency of the Radio Corporation of America.

GENERAL SARNOFF: Mr. Chairman, Honored Guests, Ladies and Gentlemen:

First, I should like to make it clear that while I have the honor of wearing the Army uniform, I am not here representing the United States Army.

Secondly, I should like to make it clear that while I have the honor in civilian life of being President of the Radio Corporation of America, I am not here tonight representing RCA.

I am here really in the person of an old wireless operator who has never ceased to marvel at the new things of radio, whether it be in sight or in sound.

I am deeply appreciative of the high honor you have paid me tonight. It was not until two days ago that I had learned of your intention and so my extemporaneous remarks are offered in place of a prepared speech. But, on the other hand, I would be less than frank if I said that after all these years in radio, I need preparation in order to tell you what is in my heart and in my mind when I speak of the great art and industry to which you and I are attached.

### *A Dream That Cost Millions*

I was very happy that Dr. Zworykin put the calendar back a bit and reminded me of the days when he first came to my office. He was not as much of a dreamer as he would have you believe. In fact, he was a very good salesman. I was the dreamer for I believed him. He explained to me the intricacies of the Iconoscope and the storage principle, about which I did not know very much then and do not know too much today. But he did make it very clear in response to my question as to how much it would cost; that it would cost about $100,000. I was the dreamer, for since then it has cost more than $10,000,000. However, I have no regrets.

With all the genius that has been exhibited before you tonight, I still believe that the sum total of their imaginations will, five years or ten years, or twenty years from tonight, be regarded as having fallen far short of the realities.

It is not so long ago that I spent two weeks with the late Senatore Guglielmo Marconi on his yacht, the Elettra in the days before the war when I used to visit him annually and at times witness the various experiments in which he was engaged. At that particular time, he was experimenting with short waves, endeavoring to establish a form of communication with Australia from the English Channel.

I could not be very helpful to him as a scientist, but perhaps I was a little helpful as just an operator, for I sat at the key in that laboratory on his yacht communicating with my friends in Australia.

It was five o'clock in the morning when we had finished those experiments and were about to retire when Marconi said to me, "David there is one thing I would like to know before I die." And I said "Senatore, what is that one thing?"

BRIG. GEN. DAVID SARNOFF, PRESIDENT OF RCA, RECEIVES A MEDAL REPRESENTING HIS CITATION BY THE TELEVISION BROADCASTERS ASSOCIATION, INC., FROM PAUL RAIBOURN, CHAIRMAN OF THE TBA COMMITTEE OF AWARDS.



He said, "I would like to know *why* this thing works." And that was Marconi.

Ladies and Gentlemen, it is a great thrill to me to be here tonight after having spent some eight months on the other side from which I only recently returned.

### *A Contrast With War*

I wonder if anyone here has been impressed with the simple fact that you can, at this hour of the evening, assemble in one lighted room and sit in peaceful surroundings and listen to discussions about post-war possibilities and leave the hall and enter lighted streets and get your taxis and return home, and during all of that time, have no thought of a buzz bomb or a V-1 or V-2 or V-X, that might come to interfere with your evening's program.

I have not had that privilege and millions of others have not had that privilege for some time and I just cannot help remarking about that very simple, little fact. You are thrice blessed in living here and I know that one need not remind you of all the things you are doing and will continue to do to help end the war over there as quickly as possible and to restore peace and tranquility and to replace darkness with light over there as well.

I am thrilled to come back and to find on an occasion such as this, such perfect unanimity, such harmony within the industry that I have not known for twenty-five or thirty-five years. I have not heard anybody here argue tonight about frequencies or colors or dimensions or lines, and I submit, Ladies and Gentlemen, that this is a good place and this is a good time to bury those arguments.

I do not believe that anyone in America, in any organization, has any different purpose or different objective. Surely, we all know that television is not a finished art. We hope it will never be finished, for when an art is finished, the industry is finished too.

Surely we all know that there are bound to be developments as we go on from year to year, but we cannot wait for the unknown developments to reach a point of perfection in the laboratory before we make the products available for service to the public.

I might tell you that although I was not abroad for the purpose of studying television, I could not help learning or finding out what was going on over there in my contacts with the various laboratories, radio, and communication organizations.

Of course, you will not expect me to discuss anything remotely relating to military affairs, nor to tell you in any detail how great has been the contribution of television to war communication activities, whether it be on the sea, or under the sea, or on land, or in the air.

But, after all is said and done, radar, itself, is but a simplification of television and that is no secret. Many of the devices born out of television have been applied in the daily tasks of warfare.

### *America Leads In Television*

But, I can tell you that I have seen the technical developments in the field of television in several countries in Europe, primarily in England, which, I believe, is far ahead of any other country in Europe in the technical development of television.

And I can say to you without reservation that in my judgment there is nothing on the other side that is technically superior or technically in advance of the technique of television in the United States. I do not believe that they are ahead of us technically. In fact, I believe the contrary to be true. I believe that we are ahead of Europe in the technical development of television

Having said that much to you, however, frankness compels me to add that in the matter of *planning* for the *use* of television immediately after the European hostilities cease, I believe that England is far ahead of the United States in that planning.

And so, you have here almost a repetition of the circumstances which prevailed at the time England first introduced television as a public service. I think we were then as far advanced, if not farther, than England in the technical development of television, but England was first in making it available for service to the public.

Unless such remaining differences as may exist within the industry are composed, and unless the United States proceeds with its planning for a public service of television, as soon as the war is over and as soon as materials and the necessary frequencies are made available, I believe that England will once more take the lead in the establishment of television as a public service.

Of course, their problems are somewhat different from ours. Their country is smaller. The problems of inter-connection will be smaller but nevertheless, we have solutions that can be applied to the larger problems which exist in America. We have larger resources and I think larger manpower and organization to solve these larger problems.

We enter now a new phase in the development of television. Whatever its possibilities or whatever its limitations, one thing you may be certain of, there is not only national but world-wide interest in the great promise of television as a post-war art and a post-war industry. That nation which establishes television first, will undoubtedly have the first great advantage in establishing its designs, its patterns, its standards in the rest of the world and thus gain a great advantage in export markets.

It is of vital importance to America not only from the standpoint of rendering a new service made possible by television, but from the standpoint of not being out-distanced in the important export fields, that we be ready at least as soon as any other exporting nation of the world may be ready, and I should hope sooner.

### *The Birth of Three Industries*

Now, before I conclude, may I say to you that it is not given to many men to have the privilege of witnessing the birth of three great branches of an industry, or perhaps three separate industries, in the course of one lifetime, and that has been my privilege. I witnessed the birth of broadcasting which followed the end of the First World War. I attended the first meetings of broadcasting associations and manufacturing associations which were then established at a time when there was a great deal of doubt as to whether the little music boxes that we introduced as radio broadcast receivers had significance as an instrumentality for dissem-

inating information and entertainment and culture or whether they were merely a passing fancy, a little gadget, something with which the amateur in the attic succeeded in arousing interest. That was the birth of the broadcasting industry.

I witnessed the birth of the radio communication industry when stations were erected to compete with age-old cables that lay on the bottom of the Seven Seas. There were many who doubted that a transoceanic radio circuit ever could successfully compete with cables. Radio was not secret, said they. It was full of static, etc. Well, you all know what has happened in the field of international communication. You know to what extent the world now is dependent upon radio circuits. You know what a part radio communication is playing in this war everywhere in the world.

And now, before the Second World War is over, it is my good fortune to be present with you tonight and to witness the launching of another new industry of radio—Television—sight being added to sound.

### *Sights' Relation to Sound*

I subscribe to all the predictions which have been made here tonight. I believe that television has a boundless future. I believe that it will be a greater industry and a greater art than broadcasting, but I do not believe that the two are mutually competitive or mutually exclusive.

Rather, I believe that sight and sound will be united in order to serve the human brain by the ear as well as the eye with a message of information, of entertainment, of culture, and of Government.

Therefore, I would not place any limits on anyone's imagination about the wide scope and the untold possibilities of this great, new art but I should like to make just one observation.

When I was much younger, I used to believe that the great job of the scientist and the engineer, and the industrialist, was to create new inventions, new instrumentalities, and new equipment. I still believe it is their job. But as I have grown older and as I have seen some other developments in the world—particularly during the present war—I can no longer be content with the belief that the job of creation is the only responsibility of the scientist, of the engineer, and of the industrialist.

This world is interested not alone in the *creation* of a new instrumentality, but also in its *use*, a very important aspect of our social progress. In fact, our technological progress has been so rapid in the past decade or two, that our social progress has lagged behind. This lack of equilibrium has done much to complicate the affairs of the world.

I do not believe that science is to blame for this war. Rather, I believe that science will help to destroy dictatorship and to preserve freedom and democracy. Science ultimately will provide man with his basic needs—food, shelter, and clothing — and thus enable world peace to rest on a solid foundation.

In the interim, and during these periods of transition, let us not lose sight of the fact that while electromagnetic waves travel through space with the speed of light, 186,000 miles a second, they can carry a *lie* with the same speed that carries the *truth*. Since they both travel with the same speed, the use made of these radio instrumentalities is vitally important.

It will be even of greater importance when, to the art of exposition, there will be added the art of demonstration, when sight and sound combine to bring its message into every home in our land and in the world may that message be of good will and of peace for a world that needs both.

## Dr. Zworykin Honored

*First award for technical pioneering in television was presented by TBA to Dr. V. K. Zworykin, Associate Research Director, RCA Laboratories. The transcription of the presentation by Paul Raibourn and the reply of Dr. Zworykin follows:*

MR. RAIBOURN: We now turn to the engineering awards. . . . . .

These awards, now to be made, are more or less coordinate and from the standpoint that no one individual has made television what it is today. They are all equal.

But in another sense, there is a First Award. There were about three hundred fifty answers to questionnaires which the Committee sent out as to who should receive these types of awards, and about one name they were particularly unanimous. That name is the name of Dr. Vladimir K. Zworykin of the RCA Laboratories, Princeton, New Jersey.

The citation is for the development of the iconoscope and the storage principle of picture pick-up resulting in the first practical television pick-up equipment.

Gentlemen, I give you Dr. Zworykin.

DR. ZWORYKIN: Thank you, Mr. Raibourn.

Ladies and gentlemen, it gives me great pleasure to receive this award.

I am asked to say a few words about the future of television. One can speak hours concerning the future of television, but since I am

A MEDAL REPRESENTING THE FIRST AWARD FOR TECHNICAL PIONEERING MADE BY TBA IS PRESENTED TO DR. V. K. ZWORYKIN, ASSOCIATE RESEARCH DIRECTOR, RCA LABORATORIES, BY PAUL RAIBOURN.



limited for three minutes only, I can say very little.

But before speaking about the future of television, I cannot help but say just a few words about the past.

Many, many years ago—it seems like ages in the television standard of time, as a matter of fact, about seventeen years ago — a dreamer came to a gentleman who was in charge of controlling the destiny of research and told him about his dream.

This gentleman, instead of laughing at his dream and telling him that he was a fool, listened to him and said, "That sounds good. How much do you need to finish this development?"

### *Dreams of Future*

Well, the name of this gentleman is Mister, and now, General Sarnoff.

From that day, it is possible to trace many developments, many tubes which are used in present day television.

Regarding the future, as I said before, I can say very little, but I would like to tell you about one of my dreams. I will not promise you that it will happen tomorrow nor that it will happen two days after the end of the war but it will probably happen in the future.

Let us start first with what we have now. A great deal has been said about the iconoscope, about pick-up for television, which utilizes storage principles.

Due to this storage principle, it is possible to increase enormously the sensitivity of pick-up devices. It has also been said a great deal that the present iconoscope utilizes very small advantages of this storage principle for some technical reasons.

So, starting from this point, we can dream that all these advantages will be fully realized. Then we will have a pick-up tube for television which can pick up the images, not just with great light, not during the daytime, but at any time when the human eye can see something.

Then we can dream still further. We can dream that all this equipment can be made smaller so that the whole pick-up tube and such equipment can be made in a small camera, similar to a Graflex, so we can put it around our neck and transmit television by means of a little strap behind our shoulder, something like the walkie-talkie at the present time, with the antenna on our back.

Then, since that can be done on centimeter waves, it will not be difficult to get a great number of channels. At least, I hope so.

We can send out a number of television reporters. They will televise anything they see that in their opinion is worthwhile, and all these pictures will be received by television.

You may see the pictures all the time and you may have the editor look at them, select the best, and switch them on the television broadcasting transmitter.

Then we will have the program all the time and we will have no difficulty with the Program Committee.

Furthermore, since such equipment is so small, we can put it into any place where we would hesitate to do it now. For instance, we can put it in a lecture room and transmit a lecture of a famous professor. We can put it in a surgical room and transmit the operations of famous surgeons.

We can also put it on top of a mountain and transmit some kind of celestial event. More than that, the camera does not need to have an operator, so we can make it automatic. We can send it to different parts of the world. We can put it in a burning building. We can put it on the bottom of the sea and if you wish, we can put it in a rocket and send it to the moon.

Thank you.

## Award to NBC'S WNBT

NBC's television station WNBT in New York, along with WRGB, Schenectady, and WPTZ, Philadelphia, was awarded a citation for its pioneering in television network operations by the Television Broadcasters Association, Inc., during the Association's First Annual Conference in New York on December 12. The citation read:

"For the first examples in the world of network operation and resulting division of program costs."

## Cited By Signal Corps



*Chester W. Latimer, Vice President and Chief Engineer of R.C.A. Communications, Inc., has been awarded the United States Army Signal Corps' Certificate of Appreciation for "excellent cooperation and patriotic service." The presentation was made at Mr. Latimer's offices at 66 Broad Street by Colonel Jay D. B. Lattin, Signal Officer of the Second Service Command, representing Major General H. C. Ingles, Chief Signal Officer, U. S. Army.*

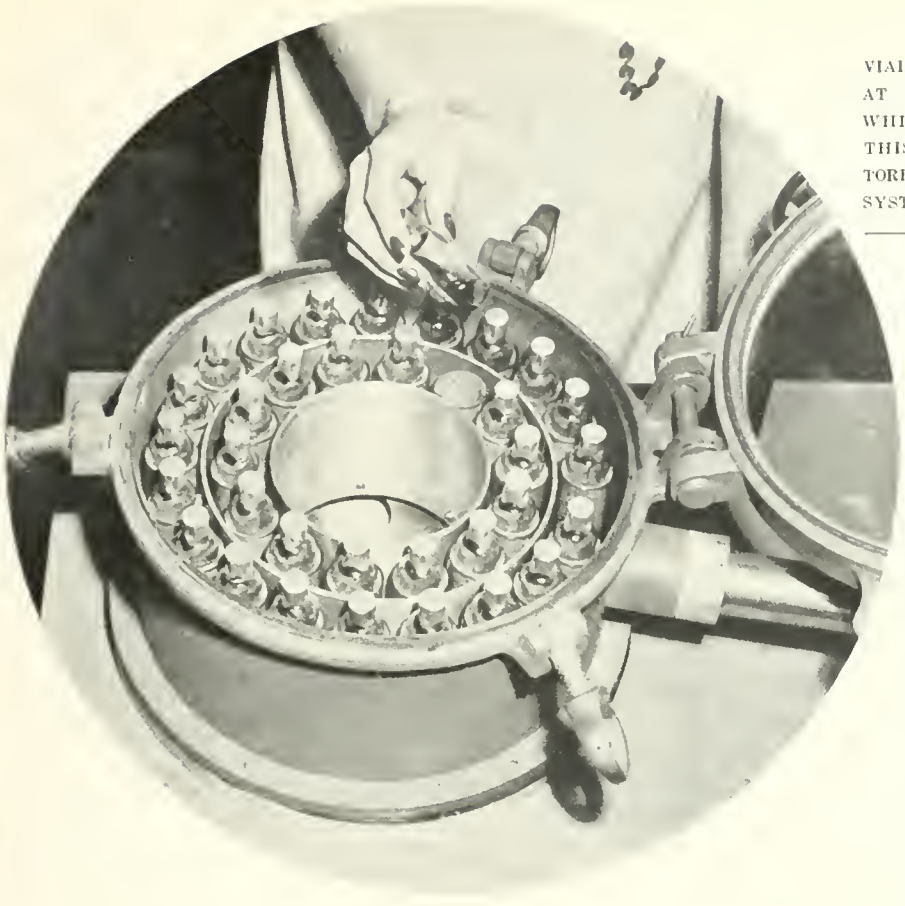
## Television Aids Vets

Television broadcasts are of great interest and value in the psychiatric treatment and reconditioning of mentally ill patients, according to a staff report submitted to the commanding officer of one of the 8 service hospitals near New York City, which have been equipped with television receivers.

Wounded and ill servicemen, the report continues, enjoy all types of programs. In sports, they favor boxing over wrestling but dramatic productions also have wide appeal.

According to figures supplied the National Broadcasting Company, the average audience per hospital television set is 35.

At the present time, 55 sets, supplied through the cooperation of Radio Corporation of America, NBC, and others have been installed in the hospitals.



VIALS OF PENICILLIN CONCENTRATE ROTATE AT 3,000 RPM UNDER MODERATE VACUUM WHILE RADIO FREQUENCY HEAT IS APPLIED IN THIS CHAMBER DEVELOPED AT RCA LABORATORIES, AS A PART OF ITS ALL-ELECTRONIC SYSTEM FOR DEHYDRATING THE WONDER DRUG.

# NEW SYSTEM FOR PENICILLIN

*First All-Electronic Drying System for Producing Wonder Drug, Developed at RCA Laboratories, Is Announced at Exposition.*

SPECTACULAR progress of the Radio Corporation of America in efforts to eliminate one of the chief bottlenecks in the production of penicillin was revealed at the National Chemical Exposition in Chicago on November 18. Appearing there in a symposium of experts on high-frequency heating, Dr. George H. Brown, of RCA Laboratories, announced completion of the first all-electronic drying system for producing the wonder drug —a process by which ready-to-use ampuls of penicillin can be obtained at the rate of 200,000,000 Oxford units an hour from a single RCA installation. This is much faster than the conventional "freeze-drying" method.

Output at this rate, based on around-the-clock operation, would in one month exceed the combined production of all the penicillin plants in the United States during a 30-day period six months ago, according to Dr. Brown. Yet, he told the audience of chemists at the Chicago Coliseum, the electronic installation requires less floor space than an average business office, 20-by-20 feet.

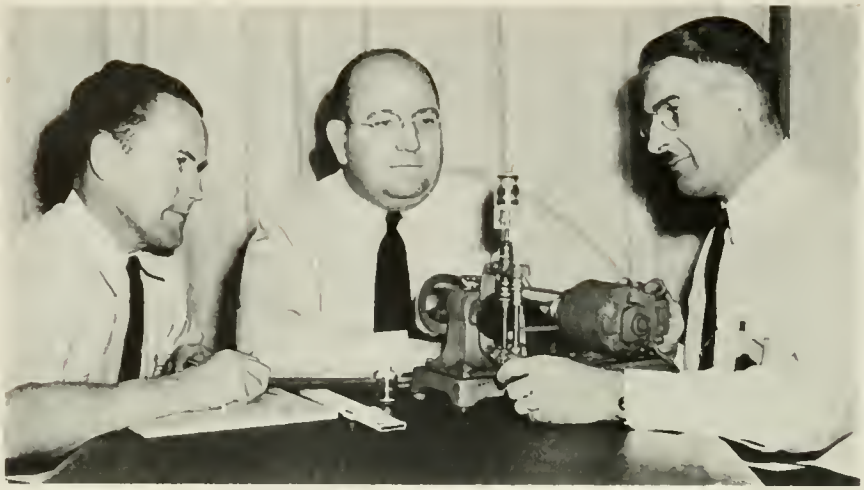
Recalling that last June he and his associates, R. A. Bierwirth and C. N. Hoyler, built and installed at the penicillin plant of E. R. Squibb & Sons the first part of the new system, Dr. Brown said that it consisted of an electronic dehydrator, about the size of an up-ended desk. This completed in 30 minutes an operation that required 24 hours by "freeze-drying" in the bulk-reduction of penicillin solution, a vital step in production.

Success with the equipment at Squibb's led to experiments in which Dr. Brown and his associates attempted to apply the electronic science of radio-frequency heating to the final phase of production— that of reducing the concentrated penicillin solution of 100,000 Oxford units per cubic centimeter to a dry state in ampuls or vials for shipment to places of urgency designated by the War Production Board.

Since ordinary heat methods destroy the effectiveness of penicillin, plants under WPB control have been achieving bulk-reduction of penicillin solution and the final drying process through the use of dry ice and a high vacuum at below freezing temperatures. The RCA scientists discovered that in a moderate vacuum they could boil and evaporate the solution at 50 degrees Fahrenheit, a temperature that does no harm to the drug during its brief period of exposure.

This knowledge was helpful in tackling the final problem, but it was found that when the vacuum was applied to the 20 cc. bottles containing 1 cc. of concentrated penicillin solution, the liquid foamed and much of it was lost. This appeared to be an insurmountable obstacle for a while. Then it occurred to the scientists that revolving the bottles at a speed high enough to cause the liquid to form a thin layer around the walls of the bottle might solve the problem.

Dr. Brown and his associates designed such a rotator and were rewarded by the discovery that it not only worked but the thin layer of liquid would evaporate much faster than anticipated. They next built a vacuum chamber out of — of all things — a reconditioned porthole frame and window—and in it they placed thirty-four rotators that could spin up to 3,000 revolutions a minute. They used three metal belts between the circling rows of the rotators as electronic plates and caused radio-frequency current to flow between the plates.



DR. GEORGE H. BROWN, INVENTOR OF THE ALL-ELECTRONIC SYSTEM FOR DEHYDRATING PENICILLIN, AND HIS ASSOCIATES, C. N. HOYLER AND R. A. BIERWIRTH, STUDY AN EXPERIMENTAL SET-UP DESIGNED TO ELIMINATE FOAMING OF PENICILLIN BROTH.

Next they conceived a revolving table with six of the unique radio heat chambers atop of it in such a manner that three of the chambers could be exposed to the current at one time. The table turns 60 degrees at one-minute intervals, thus giving each of the thirty-four ampuls of penicillin in the chambers three minutes of current and at the same time allowing for the unloading and loading process as the chambers make the circuit.

This electronic turntable has a potential output of 2,000 ampuls an hour, with each of the ampuls containing the standard of 100,000 Oxford units of the drug, for a total of 200,000,000 Oxford units an hour. This is sufficient for 10,000 normal doses.

It was discovered for perfection in drying, however, additional heating was necessary. This is achieved through the use of electrically heated domes into which the vials may be placed in aluminum casting containing 102 each. In one hour, the entire process is completed.

The whole setup works on a push-button arrangement and may be started or stopped at will without endangering the drug under process. But its great advantages are that it affords a continuous production at a fixed rate of speed, necessitates only a fraction of the floor space required by the conventional freeze-drying systems and operates at cost far below that of the other system, Dr. Brown pointed out.

RCA's electronic bulk-reducer used in the first step consists of three large glass bulbs, connected in vertical series, and attached to a pump that maintains a relatively low vacuum. To the setup is connected a 2,000-watt radio-frequency generator. Electrodes carrying the output of the electronic generator are attached to the base of the lowest glass bulb which, when the unit is in operation, holds about 2,000 cubic centimeters of liquid. From the base of the bulb, a glass tube extends downward for several inches, so that when a beaker of penicillin broth is placed on a platform beneath, it almost reaches the bottom of the beaker.

As the vacuum pump starts, the suction draws the solution into the base of the lower bulb. The radio current is turned on and, as the current passes through the solution, heat up to 50 degrees is created and the liquid boils. This causes an evaporation at the rate of two litres an hour.

It was revealed that interest in the all-electronic system has been shown by several of the United Nations governments. Representatives of Great Britain, China, Russia, and Brazil have made direct inquiries. Arrangements have not as yet been made for the manufacture of the equipment.

# NBC ELECTION RETURNS WIN BIGGEST AUDIENCE

***Hooper Survey Shows Network's Program Held Lead Consistently During Period Covered.***

THE listening audience, more than half again as large as that of a typical Tuesday night, showed a decided preference for the election returns program broadcast November 7 by the National Broadcasting Company, according to a survey made by C. E. Hooper, Inc. NBC held the lead consistently throughout the period covered by the survey.

With radio sets in use varying from 40 per cent to 57 per cent of the total sets in the United States, NBC's treatment of the election earned average audience ratings from 13.2 to 23.3 per cent. The smaller audience was checked between 7:00 and 8:00 p.m., the larger between 9:00 and 10:00. Between 7 and 10:30 p.m., the survey period, NBC's audience rating averaged 49 per cent over the next highest network and 41 per cent above the combined total of the third and fourth networks.

To accomplish this complete coverage, NBC concentrated activities in Studio 8H, the world's largest radio studio. Network commentators from Washington and New York occupied a central dais giving them a view of the 50-foot election chart erected against the rear wall of the studio. Tabulators seated at tables on the stage compiled the material as it was received from AP, UP and INS on a battery of teletype machines, and relayed the information to markers who transferred them to the chart.

Direct lines to headquarters of both major parties and to Kansas City and Columbus, home cities of the vice presidential candidates, gave NBC additional sources of election news and trends, as reported by NBC analysts stationed there.

NBC's audience-building plan of election night operations, originated and supervised by William F. Brooks, NBC director of news and special events, placed emphasis on maintaining a constant flow of returns.

# NBC DRAMATIZES HOME LIFE

*Newest Course Presented by NBC University of the Air Is Called "Home Is What You Make It"—Material Is Factual and Timely.*

FOURTH and newest course to be presented under the auspices of the NBC University of the Air is "Home Is What You Make It," a 28-week series of half-hour dramatizations heard Saturdays at 9:00 a.m. (EWT).

The new home economics course is devoted to the men and women of the nation who are concerned with the many elements that go to make up successful home life. The series is sponsored in cooperation with the NBC University of the Air by the General Federation of Women's Clubs, the American Home Economics Association and the National Congress of Parents and Teachers.

Factual and timely, popular in style, and educational in purpose, the broadcasts take the form of dramatizations of the important aspects of home life. Directed primarily to the homemaker, and designed to bring her a thorough understanding of her new and ever-changing problems, "Home Is What You Make It" stresses the importance of cooperative family relations, and contains material of vital interest to every member of the family.

In addition to the dramatizations, each program presents an outstanding expert in the field under discussion. The course is divided into the following subjects:

HOUSING (planning for the new home and remodeling the present one);

HOME DECORATION (and the purchase, use and preservation of home equipment);

CHILD CARE AND TRAINING (the development of personality; helps for new mothers);

SCHOOLING (progressive and conservative educational measures);

HEALTH (in relation to nutrition as well as to the medical requirements of the family);

CLOTHING (home sewing and the purchase of new clothing);

GARDENING (for city dwellers as well as for small-town folk);

BEAUTY AND GROOMING;

BUDGETING (the wise use of money);



STERLING FISHER, DIRECTOR OF THE NBC UNIVERSITY OF THE AIR.

CIVIC INTERESTS (one's responsibility to the community);

CULTURAL AND SPIRITUAL VALUES (music, art, books);

PROBLEMS OF YOUTH (in urban and small-town environments);

For "Home Is What You Make It," as for other NBC University of the Air courses, a handbook of background material and suggested reading accompanies the series. This handbook differs from the others in that separate chapters are written by authorities in the various fields under discussion.

Narrator and program host for the series is Don Goddard, well-known WEAF and NBC news commentator. Supervising and coordinating "Home Is What You Make It" is Jane Tiffany Wagner, newly-appointed Director of Home Economics for NBC.

The NBC University of the Air is directed by Sterling Fisher, under the general guidance of Dr. James Rowland Angell, NBC Public Service Counselor. Other NBC University of the Air courses now on the air are the history series, "We Came This Way" (Fridays, 11:30 p.m., EWT); the literature course, "The World's Great Novels" (Saturdays, 7:00 p.m., EWT), and the music series, "Music of the New World" (Thursdays, 11:30 p.m., EWT).

PROGRAM HOST AND NARRATOR OF NBC'S COURSE IN HOME ECONOMICS IS DON GODDARD, SHOWN HERE AT HOME WITH HIS FAMILY.





IN CIRCLE—FABIEN SEVITZKY, CONDUCTOR OF INDIANAPOLIS SYMPHONY ORCHESTRA. BELOW—REGINALD STEWART, LEFT, CONDUCTOR OF THE BALTIMORE SYMPHONY ORCHESTRA, AND EFREM KURTZ, CONDUCTOR OF THE KANSAS CITY PHILHARMONIC ORCHESTRA.





# ORCHESTRAS OF THE NATION

*Five Major American Orchestras, All Broadcasting from Home Cities, are Participating in 24-Week Schedule Arranged by NBC*

ORCHESTRAS of the Nation," one of the National Broadcasting Company's great musical presentations, has a purpose over and above its value as entertainment, according to Samuel Chotzinoff, manager of the NBC music division, and that purpose is to show all of America what the orchestras in various sections of the country are doing.

Inaugurated on the air last season when NBC presented a group of broadcasts by the Chicago Symphony Orchestra under the direction of Desire Defauw, the series was resumed on December 16. It is being heard on Saturdays, from 3 to 4 p.m., EWT.

Five major American orchestras are participating in the current season, all of them broadcasting from their home cities.

Featured orchestras and their conductors for the 24-week 1944-1945 schedule are the Kansas City Philharmonic conducted by Efrem Kurtz, the Indianapolis Symphony headed by Fabien Sevitzky, the Baltimore Symphony directed by Reginald Stewart, the Eastman School (Rochester, New York) Symphony led by Dr. Howard Hanson, and the Chicago Symphony under Defauw.

The Kansas City group opened the season with the broadcasts of December 16 and 23. The Indianapolis group followed for the dates of December 30 through January 13. Baltimore takes the microphone January 20, through February 3. On February 10, the Indianapolis Symphony returns for three dates ending February 24, and the Baltimore group also encores for three concerts, March 3 through 17.

On March 24, the Chicago Symphony starts its second season on the series, holding the microphone each Saturday through April 21. Dr. Hanson conducts the Eastman School Symphony April 28 through May 26, when the season closes.

Three of the conductors represented on the series—Efrem Kurtz, Reginald Stewart and Desire Defauw — are remembered by NBC audiences for their guest appearances with the NBC Symphony Orchestra in past seasons.

"It is the duty of a great network," Mr. Chotzinoff said, "to reveal what the entire nation is doing in the way of good music. This cannot be achieved by featuring just a single orchestra from one city."



ABOVE—DESIRE DEFAUW, CONDUCTOR OF THE CHICAGO SYMPHONY ORCHESTRA. BELOW—DR. HOWARD HANSON, CONDUCTOR OF THE EASTMAN SCHOOL (ROCHESTER) SYMPHONY ORCHESTRA.





DAVID SARNOFF, PRESIDENT OF RCA, RECEIVES THE STAR DENOTING THE RANK OF BRIGADIER GENERAL OF THE U. S. ARMY FROM MAJ. GEN. HARRY C. INGLES, CHIEF SIGNAL OFFICER, U. S. ARMY.

# SARNOFF BECOMES A GENERAL

***Nominated for Rank of Brigadier General by President Roosevelt Following Overseas Duty, His Promotion is Confirmed by Senate December 6.***

SHORTLY after his return from eight months' service overseas as a Colonel in the United States Army, David Sarnoff, president of the Radio Corporation of America, was elevated to the rank of Brigadier General. His nomination for the promotion, sent by President Franklin D. Roosevelt to the U. S. Senate on November 21 was confirmed on December 6.

Attached to Supreme Headquarters, Allied Expeditionary Force, in England prior to D-Day and in France after D-Day, as a special consultant to General Eisenhower on communications, General Sarnoff on October 11 was awarded the Legion of Merit Medal for "exceptionally meritorious conduct in the performance of outstanding service."

His citation in full read:

"Colonel David Sarnoff, (Army Serial No. 0208338), Signal Corps, United States Army, for exceptionally meritorious conduct in the performance of outstanding service while serving as Assistant to the Deputy Chief Signal Officer, Supreme Headquarters, Allied Expeditionary Force, from 23 August 1944 to 16 September 1944. Colonel Sarnoff was largely responsible for reopening communications in Paris, thus enabling press communications to resume both to the United Kingdom and to the United States. His ingenuity and resourcefulness made it possible to restore cables which had been severed by the enemy, and allowed French radio experts who had not worked for many years during the occupation, to return to their former duties. Colonel Sarnoff's outstanding devotion to duty, courage, and great diplomacy in handling French citizens have aided materially in overcoming the great difficulties in attaining this objective. Entered military service from New York."

## NBC WINS 14 FIRSTS IN RADIO DAILY POLL

***Information Please and Bob Hope Take Double Honors in First "Certified Survey"***

NBC stars and programs garnered fourteen of twenty-six available places to sweep the All-American Radio Program, released by *Radio Daily* on January 10.

In its "first certified survey," the trade paper sent interviewers into the field to collect the votes of 1,051 editors and writers of newspapers, magazines and trade press of the nation.

"Information Please" and Bob Hope won double honors. The former was chosen as the favorite commercial program and favorite quiz show. Bob Hope was named favorite entertainer and also favorite comedian. Bing Crosby and Dinah Shore were tops among popular vocalists and John Charles Thomas drew most votes as favorite male classical vocalist.

In the comedy field, Joan Davis was elected favorite comedienne and Fibber McGee and Molly, favorite comedy team. Bill Stern topped the sports commentators and Don Wilson drew peak honors as radio announcer.

Favorite news commentator selected was Lowell Thomas. Arturo Toscanini was named favorite symphonic conductor and "One Man's Family" was chosen favorite dramatic serial.

Two additional classifications placed "I'll Walk Alone" as the favorite song of 1944 and "Holiday for Strings" as the favorite musical composition of the year.

## New Series On NBC

A significant new public service program, "America United," which for the first time makes available the facilities of a national network at a regular period each week to major labor, agricultural, and business groups for the discussion of cooperative efforts and mutual objectives, has been announced by Niles Trammell, president of the National Broadcasting Company. Program time is Sundays, 1:15 to 1:30 p.m.

# SEES VAST NEW TUBE MARKET

*Increasing Uses of Electronic Power and Electronic Controls Will Create Huge Demand in Manufacturing, Processing, Teegarden Says.*

A VAST new postwar market for electron tubes, far exceeding the prewar demands of radio and communications, will be found in manufacturing and processing industries as a result of increasing uses of electronic power and electronic controls, according to L. W. Teegarden, manager of the RCA Victor Division, Radio Corporation of America.

The rated power represented by a single order recently received by RCA for power oscillator tubes for electronic power heating, Mr. Teegarden said, was equal to the combined rated power of all radio stations in the United States.

"Improvement in the quality of products and dramatic savings in process time are being realized from the use of electronic power for an ever-increasing list of industrial heat-processing operations," he said. "These now include hardening, welding, and soldering of metals; preheating of plastic materials for molding; glue-bonding of wood; drying of textile yarns; bulk-reduction of solutions, and many other processes. Added advantages found in many instances are savings in space, equipment, and costs.

"As a result, it appears that industry's postwar demand for power tubes, which constitute the heart of any electronic power generator, may be many times the total prewar demand, which came principally from the broadcasting field. The growth of electronic power heating applications also presents an increasing market for other types of tubes, such as rectifiers and control tubes."

An electronic power generator is essentially the same in principle as a radio broadcast transmitter, Mr. Teegarden explained, except that it is less complex in operation, and the high-frequency output is fed into the industrial material being treated, instead of being coupled to a transmitter antenna.

"The particular types of power tubes used in many electronic power generators now being manufactured," Mr. Teegarden said, "are the RCA-892-R, the RCA-833-A, and the RCA-9C21. These are three-electrode transmitting types, designed for use as high-frequency power amplifiers, oscillators, and Class B modulators. The RCA-892-R and the RCA-833-A are air-cooled; the RCA-9C21, water-cooled. They are ideally suited for industrial use by their rugged construction, dependability and high efficiency as power converters.

"Tubes such as the RCA-8008 half-wave mercury-vapor rectifier are used in many of these generators to supply high-voltage d-c power to the plates of the power tubes. In some types of automatic generators, control tubes such as the RCA-2050 perform an additional service. The RCA-2050, a sensitive, gas-filled, four-electrode thyratron of the hot-cathode type, is especially useful for industrial heating control applications because it is virtually unaffected by temperature changes.

"All of the tubes mentioned are long-life types that have proven themselves in industrial as well as broadcast services."

---

## RCA RADIO STATION MOVED BY AIR

A COMPLETE commercial short-wave radio station, weighing twenty-five tons, has been transported hundreds of miles by air for the first time in history, from Italy to "Somewhere in Southern France," according to word received here by RCA Communications, Inc.

Moved at the request of the U. S. Army, the equipment was transported within a few hours some weeks ago by the coordinated efforts of the Army Signal Corps, RCA technicians under the supervision of Thomas D. Meola of Skaneateles, N. Y., and the Twelfth Airforce. In operation, the station is limited to Government, press, and EFM (Expeditionary Force Message) traffic. No straight commercial messages may be accepted.

In a radiogram describing the station's movement by air, Merrill Mueller, National Broadcasting Company correspondent attached to Supreme Headquarters, Allied Expeditionary Forces, in France, said:

"Fourteen C-47's moved entire twenty-five tons of equipment, which included generators so heavy it took heavy cranes to load and unload them, in a few hours, whereas surface transportation on both sea and land would have taken days and, perhaps, weeks. Thus, another important step has been taken to facilitate communications with Southern France within a few weeks through the day and night-long work of all concerned."

This is not the first time that this station, soon to be on the air in Southern France, has met an important wartime communications need, according to RCA officials. It was shipped from New York last winter, and went into service at Naples transmitting Government and press messages. Its location was then identified as "Somewhere in Italy." More than twenty RCA men, working with Mr. Meola, went along to install and operate it.

On June 13, a second RCA station which had been shipped from the United States, went into operation at Rome, first of Europe's war capitals to fall to Allied armies. Its installation and operation also were handled by the RCA staff working in cooperation with the U. S. Signal Corps and the Board of War Communications.

Still another fast, direct communications link with the European war front was established by RCA Communications on September 16, when a radio circuit between New York and Paris was reopened after being closed since June, 1940, by the German occupation.



AT THE FOURTEENTH AIR FORCE HEADQUARTERS IN CHINA, THIS AMERICAN AIRMAN OPERATES RADIO COMMUNICATION SERVICE WITH RCA TRANSMITTER AND RCA RECEIVER.

# RCA TRANSMITTERS IN CHINA

*Ten Radio Communications Units Carried Across Trackless Wastes by Truck and Ox-cart Play Major Role in War Against Japanese.*

TEN RCA radio transmitters, transported over trackless wastes of China by truck and ox-cart, and often operating from caves and temples, are credited with carrying the burden of American airforce ground communications on that Asiatic battlefront from the arrival of the Flying Tigers in 1941 until the present, it has just been disclosed.

The outstanding performance of military radio equipment was revealed by Major Charles H. Whitaker, communications officer of Gen. Chennault's 14th Airforce on his return to the United States after 26 months of service in the Orient.

The radio equipments described by Major Whitaker were manufactured by RCA Victor Company of Canada, Limited, for the Royal Canadian Air Force through whom it was made available to the Chungking Government.

The transmitters are pioneers in the radio warfare against Japan, Major Whitaker said, for they were obtained to serve the original AVG —or Flying Tigers—in 1941. They provided the eyes and ears of the American Volunteer Group until 1942 when the regular Army Air Force took over operations, and have continued to give reliable service ever since.

The sudden thrust of the Japanese at the Malay Peninsula and Burma changed original AVG plans with the result that the Flying Tigers became engaged in the retreat through Burma, successfully withdrawing their precious communications system with them into China.

"There was lots of good equipment out there," the communications officer related, "but the AT-3's (radio transmitters) had an adventurous and outstanding service record. Much of the time they were Gen. Chennault's sole means of communications. Supplies were so precious that replacement parts were only made when something went dead. The AT-3's never let us down.

"I understand they were first unloaded at Rangoon in the fall of 1941. The fighting started soon after their arrival. The AVG's clung tenaciously to them all during the fighting retreat up the Burma Road. In this ordeal they covered more than 2,000 miles of the world's roughest travel. Trucks banged them over that winding, heavily bombed road and when the road changed to a miry, jungle track they were carried by ox-cart.

"Here is an idea of the travel hazards experienced by the AT-3's and their receivers, the RCA AR-77 sets:

"A truck loaded with radio and other supplies had to ford a flooded jungle stream on a flimsy cluster of logs which operated as a native ferry. In midstream the truck rolled a bit, threatening to capsize the whole business. The driver madly tossed anything and everything into the river until the raft-ferry righted itself. When he checked the cargo he found, much to his chagrin, that he had tossed some valuable receivers into the drink. He almost cried over it. But he kept the rest of the stuff rolling on to its destination."

Arriving in the China war theater, Major Whitaker continued, the equipment became "stations" linking up the air bases. One AT-3 and one or more AR-77's comprised a "station" with a National 100 battery receiver to backstop the equipment in the event of power failure, he said. The usual place of operations was a natural cave or a native temple. The officer said these "stations" survived the rigors of the elements with little damage.

"One set I know operated in a boarded-up cave for a period of 18 months with the only equipment casualty being a resister which went bad from corrosion," he recalled.

When Jap penetration endangered the safety of the station and it had to be shifted, the communications officer declared, the operator and his two Chinese assistants merely tossed the equipment on a truck and started across country to a new spot designated by headquarters. The only insulation provided on these rough journeys was that of a mattress covering the truck-body's floor.

The AT-3 is powered 300 watts for 'phone and 400 watts for c.w. (telegraph). Their normal operating distance was from 700 to 800 miles. However, one of the AT-3's, according to an AVG operator, kept contact with Corregidor about 2000 miles away in the last hours before the Philippine Fortress' capitulation and the AR-77 received the operator's final message from the beleagured station.

The AT-3 has earned the same kind of praise in other battle theaters of the world. It was designed by the Engineering Products Division of the Canadian RCA Victor Company, under the supervision of Edmund A. Laport, now staff engineer for the RCA Victor Division's International Department at Camden, N. J. Modified for the Canadian Army Signals for mobile use, its official designation is Canadian Wireless Set 33. However, due to its outstanding performance with Canadian Army Units in European operations, it is now officially referred to as the "Maple Leaf" transmitter.

Its popularity spread rapidly and today about 1200 are functioning faithfully in action. Six hundred of these have gone to the RCAF. In addition to making them available to the Chungking government, the RCAF has turned over other equipments to the Royal Canadian Navy, the Canadian Army, the RAF Transport Command, the Canadian Department of Transport and the Royal New Zealand Air Force. They are operating in France, England, the South Pacific, the Arctic, Labrador, Newfoundland, Bermuda, Trinidad, Jamaica and along the airways of British Columbia and Alaska.

Another rugged piece of equipment in China service described by Major Whitaker was a 2 kw RCA transmitter which the Chinese had stored away in a cave near Chungking. It had been abandoned for lack of parts but the American Communications men patched it up and used it until the 10 kw three-phase generator gave out. He believes it is back again in operation

A similar record for durability was reported on the performance of the electron tubes which powered the AVG-Fourteenth Air Force equipment.

"These, too, had an exceptional record for service under rough circumstances," Major Whitaker said. "I doubt whether the equipment had a complete change of tubes from the time of its arrival in 1941 until I left. I know that in certain sets tubes had not yet been replaced and they were still going strong on my departure.



BROWDER J. THOMPSON, WHO LOST HIS LIFE DURING A FLIGHT IN AN ARMY PLANE LAST JULY, IS SHOWN HERE IN ONE OF HIS MOST RECENT PHOTOGRAPHS, TAKEN AT RCA LABORATORIES, PRINCETON, N. J.

# THOMPSON DIES IN ACTION

***Associate Research Director of RCA Laboratories, On Special Mission for Secretary of War, Killed in Mediterranean Theater.***

BROWDER JULIAN THOMPSON, Associate Research Director of RCA Laboratories, Princeton, N. J., who had been on leave from RCA since December, 1943, serving as expert consultant in the Office of the Secretary of War, was killed in action during a flight in an Army plane in the Mediterranean Theater while on a special mission for the Secretary of War, it has been announced by the War Department. Mr. Thompson was forty years old.

The announcement said that Mr. Thompson, who previously had been reported missing, lost his life on the night of July 4-5, 1944. It described his mission as "of direct and vital importance to the war."

Mr. Thompson was recognized as one of America's foremost radio research engineers, having completed many outstanding developments, including perfection of the famous "acorn" tube used in ultra-high frequencies. He headed important research work on television tubes and tubes for generating power, and was credited with advances in screen-grid tubes and power pentodes that became mainstays in broadcast reception.

A native of Roanoke, La., Mr. Thompson received a B.S. degree in electrical engineering from the University of Washington in 1925, and was engaged in vacuum tube research for General Electric until 1931, when he joined RCA as chief of the research section of the Company's Radiotron Division at Harrison, N. J. In 1940 he became Associate Director of the research laboratories of the RCA Manufacturing Company, and subsequently was appointed Associate Research Director of RCA Laboratories.

Mr. Thompson was awarded the Morris Liebmann Memorial Prize by the Institute of Radio Engineers in 1936 for his contributions to the ultra-high frequency field of radio. He was a Fellow of the Institute of Radio Engineers and the American Physical Society; a member of Tau Beta Pi; and Sigma Xi. He had been a Director of the Institute of Radio Engineers since 1937.




As individual units, these small, daring craft of the U. S. Navy are considered expendable in achieving desired objectives. But, conversely, as a part of the Fleet, they have proved themselves indispensable.

Their teamwork and remarkable effectiveness is due in no small part to their radio-electronic equipment. Radio direction-finders enable them to know their position and to locate other ships, friend and foe alike, in thick fogs and on inky-black nights. Compact ship-to-shore radio telephone sets enable them to talk with each other, giving and receiving orders with speed and accuracy.

Radiomarine has for many years been a leader in designing and building these types of radio-electronic equipment.



RADIOMARINE CORPORATION OF AMERICA, 75 VARICK ST., NEW YORK 13, N. Y.

RCA RADIOMARINE CORPORATION OF AMERICA

A SERVICE OF RADIO CORPORATION OF AMERICA

# Special LOW RATE MESSAGES

ANY THREE OF THE 237 STANDARD TEXTS NOW AVAILABLE MAY BE USED IN YOUR MESSAGE




# To our FIGHTING FORCES

# Imagine Charlie McCarthy...

# on TELEVISION



## brought to you by NBC

**Picture how much NBC Television** could add to the enjoyment of your favorite radio programs . . . the fun of watching Edgar Bergen's pugnacious, loquacious Charlie, for example . . . *seeing* as well as hearing the great shows of the air.

Imagine how television programs from the studios of the National Broadcasting Company . . . programs presented by the network which now broadcasts the most popular radio shows . . . are going to add to the enjoyment of your home entertainment.

Detailed plans have been developed by NBC which, with the co-operation of business and government will result in extensive NBC networks . . . great links gradually spreading from Eastern, Mid-Western and Western centers . . . finally forming a nation-wide television chain for the whole country in post-victory years.

Moderate-priced television receivers will supply you with sight and sound programs in keeping with the exacting standards of NBC . . . to give you the finest shows in this new field of broadcasting.

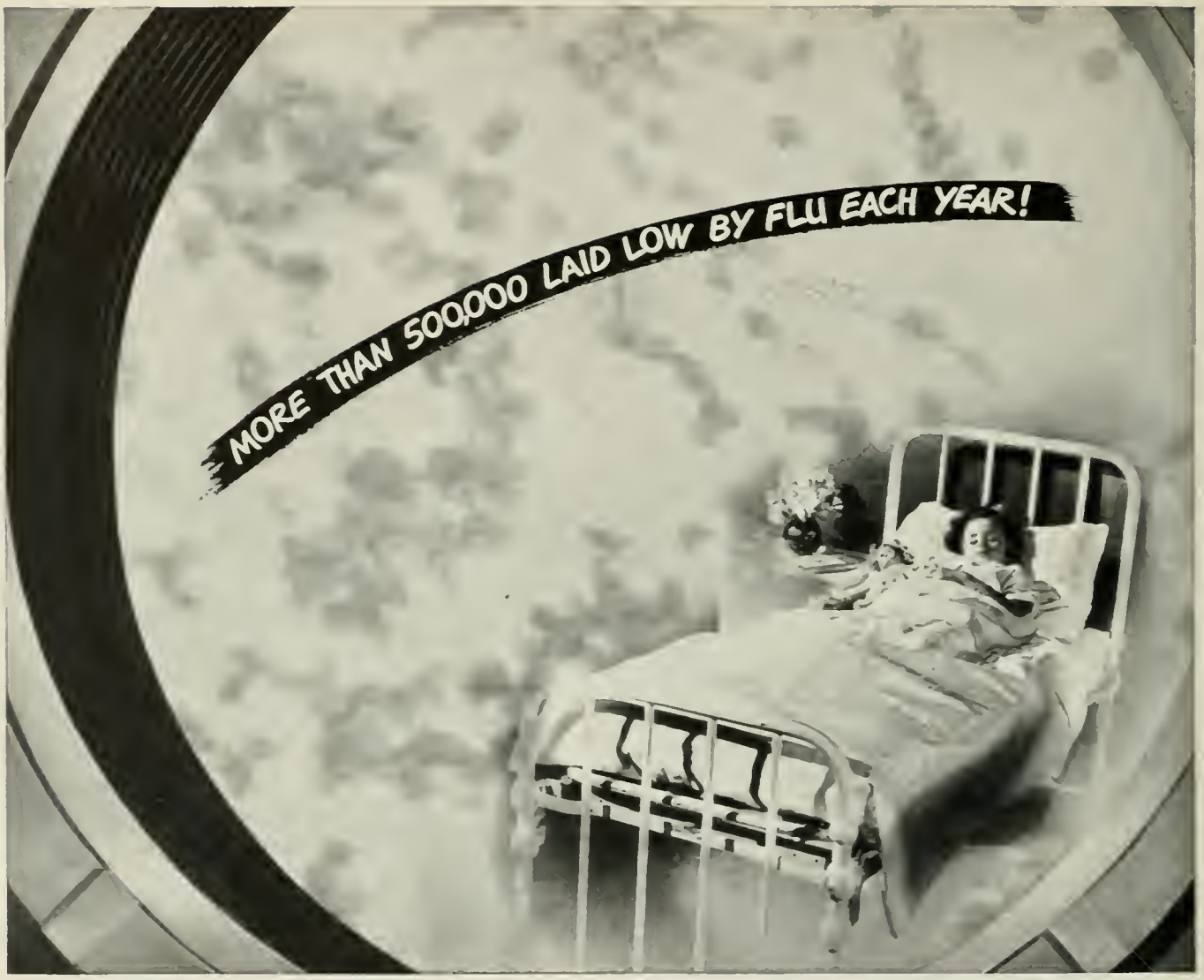
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Look to NBC to lead in these new branches of broadcasting by the same wide margin that now makes it *"The Network Most People Listen to Most."*

## National Broadcasting Company

**America's No. 1 Network**

A Service of Radio Corporation of America




## *to destroy 'em you have to see 'em*

Microscopes are gunsights in Medicine's battle on bacteria.

Optical microscopes, however, were not powerful enough to "draw an accurate bead" on the deadly virus that caused influenza.

But today, medical men have seen what no optical microscope could bring into focus—the infinitesimal influenza virus that previously had lain craftily camouflaged among larger cells.

This revelation came about through the Electron Microscope, developed by scientists at RCA Laboratories. And now, having been seen, influenza may be forced to unconditional surrender, saving the lives of thousands each year.

Here is but one facet of the genius shown by scientists behind RCA research . . . the "ever-onward" research that saves lives or creates a better radio with equal skill . . . the "there-when-you-need-it" research that gave super-secret equipment to the United Nations . . . the "way-ahead" research that goes into everything made by RCA.

When you buy an RCA radio or phonograph or television set or any RCA product, you get a great satisfaction . . . enjoy a unique pride of ownership in knowing that you possess the very finest instrument of its kind that science has yet achieved.



**They see what human eyes have never seen before!**

Drs. Arthur Vance and James Hillier, scientists at RCA Laboratories, with Mr. E. W. Engstrom, Research Director (standing), examine the RCA Electron Microscope that has useful magnification up to 100,000 diameters, revealing unseen new worlds to the eyes of man.

**RADIO CORPORATION of AMERICA**

*PIONEERS IN PROGRESS*

RCA

# RADIO AGE

RESEARCH · MANUFACTURING · COMMUNICATIONS · BROADCASTING

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RCA

APRIL

1945

Radio-Telegraph Communication Now Restored with the Liberated Countries in Europe...

# No.3 BELGIUM



No. 1.. ITALY*
No. 2.. FRANCE
No. 3.. BELGIUM*

RESTORATION
*of*
RADIO-TELEGRAPH
COMMUNICATION
*with the* LIBERATED
COUNTRIES OF EUROPE

# No.4 HOLLAND



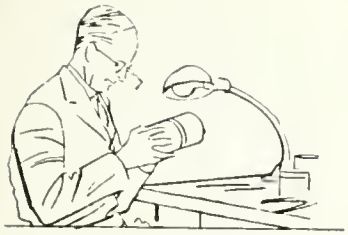
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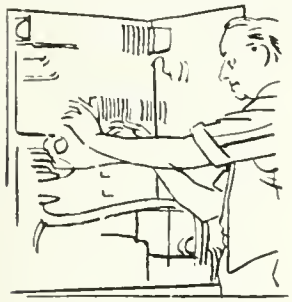
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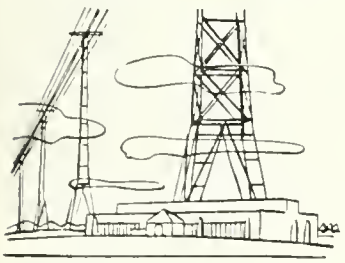
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*Until further notice, service is available only for Government and Press messages.

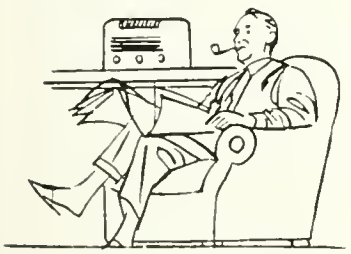
A SERVICE OF RADIO CORPORATION OF AMERICA











COVER—Cadets at the U. S. Merchant Marine Academy, Kings Point, N. Y., demonstrate the new Radiomarine Lifeboat Radio equipment. (Story on page 6.)

# RADIO AGE

RESEARCH · MANUFACTURING · COMMUNICATIONS · BROADCASTING

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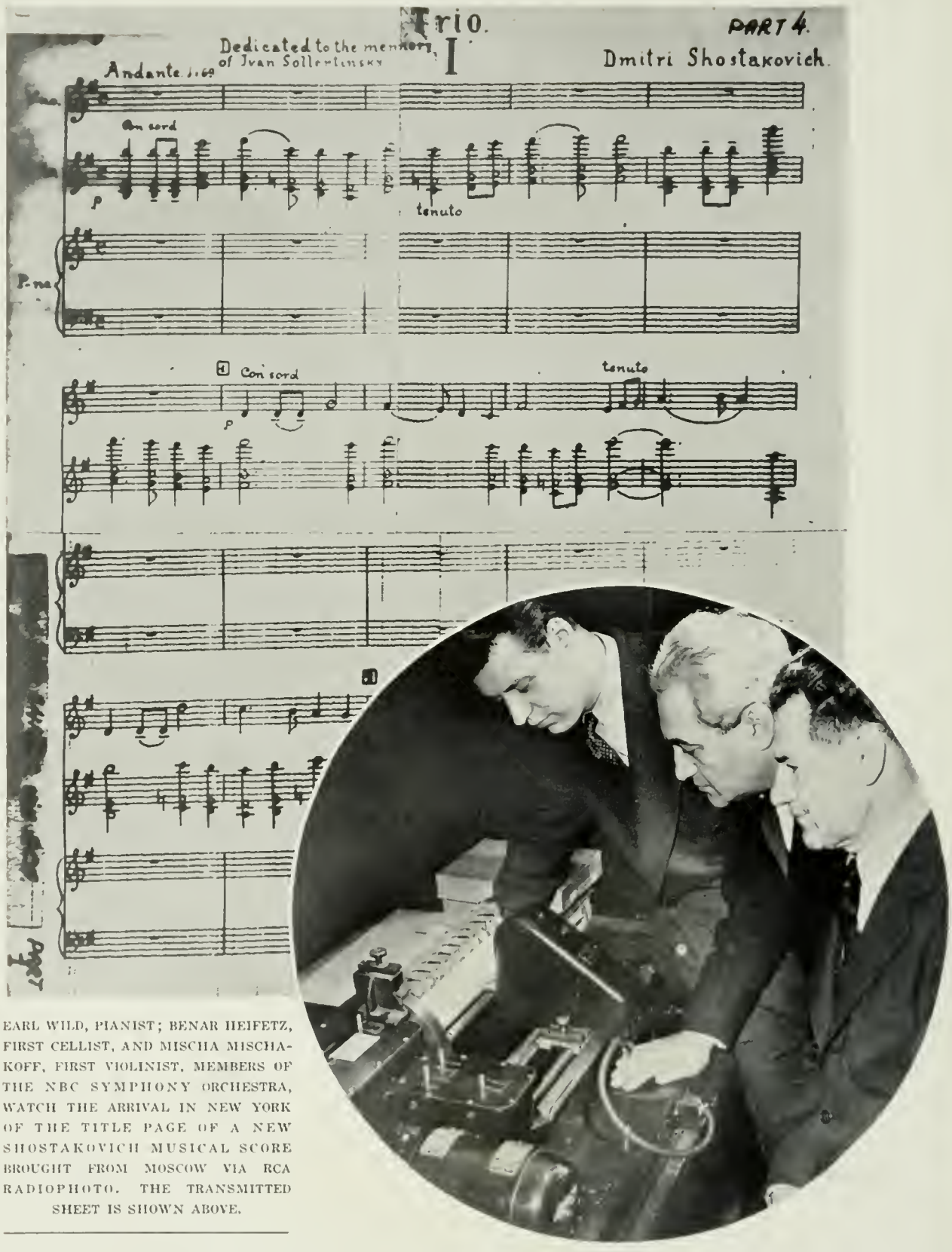
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EARL WILD, PIANIST; BENAR HEIFETZ, FIRST CELLIST, AND MISCHA MISCHAKOFF, FIRST VIOLINIST, MEMBERS OF THE NBC SYMPHONY ORCHESTRA, WATCH THE ARRIVAL IN NEW YORK OF THE TITLE PAGE OF A NEW SHOSTAKOVICH MUSICAL SCORE BROUGHT FROM MOSCOW VIA RCA RADIOPHOTO. THE TRANSMITTED SHEET IS SHOWN ABOVE.

# Wartime Achievements in Radio

*RCA ANNUAL REPORT SHOWS NEW PEAKS IN PRODUCTION OF WAR EQUIPMENT, NEW RECORDS IN COMMUNICATIONS AND 100 RESEARCH PROJECTS COMPLETED FOR ARMED SERVICES*

THE Radio Corporation of America in 1944 reached new peaks in production of radio-electronic equipment vital to the war effort, established new records in radio communications, and completed more than 100 research projects for the Armed Services, it was revealed in the RCA 25th Annual Report released February 27 by Brigadier General David Sarnoff, President.

Net profit of RCA in 1944 was $10,263,291, compared with $10,192,452 in 1943. While the earnings for 1944 are subject to renegotiation, specific provision has been made therefor on a basis not materially different from 1943. After payment of preferred dividends, earnings per share of common stock were 51.2 cents, compared with 50.5 cents per share in 1943.

Total gross income from all sources amounted to $326,421,913, compared with $294,535,362 in 1943, an increase of 10.8%.

Provision for Federal Income Taxes amounted to $29,947,900, or 14.6% more than the preceding year, and represented 74.5% of income. The tax provision in 1944 was equivalent to $2.16 per share on the outstanding common stock, compared with $1.88 in 1943.

### *On Second Quarter Century*

Recalling that RCA observed its 25th anniversary in 1944 Lieutenant General J. G. Harbord, Chairman, and Brigadier General Sarnoff, speaking for the Board of Directors, reported in a joint statement to stockholders that the company had "entered its second quarter century with full energy devoted to aiding the successful conduct of the war, ever mindful of the interest of America and its people in a postwar world at peace."

The Report states that war products delivered to the United States and its Allies by the RCA Victor Division during 1944 established an all-time record, exceeding 1943 deliveries by 16%. More than a thousand RCA engineers have been working on research, development and production of radio and electronic equipment vital to the war effort. Results of their accomplishments are found in the fact that RCA has built more than 200 new types of electron tubes and more than 350 types of apparatus not manufactured by anyone prior to the war.

### *Designs Radio Altimeter*

While the complete story of RCA's war achievements remain secret for security reasons, it is disclosed that RCA Victor has been, and is, the designer and first producer of many radio altimeters used by the Army, the Navy and the British. This essential device enables airmen to measure their distance from the ground so accurately that it makes possible more effective flying operations at night, through fog and other difficult weather conditions. It also increases the effectiveness of low-level, high-speed attacks and hedge-hopping missions; and is equally valuable in paratroop operations and in dropping supplies from the air.

Research in RCA Laboratories during 1944 was concentrated on radio and electronics, including new electron tubes, radar and other devices important to the war effort. More than 100 research projects, conducted for the Army, Navy and the Office of Scientific Research and Development, resulted in the creation of radio-electronic weapons which now are contributing to victories on many battlefronts.

Advances also were made in related work outside the category of confidential activities. For example, one of the major achievements in the field of electron tubes was the development by RCA scientists of additional miniature tubes and other types to perform new functions. These tiny tubes will shrink the size of many postwar radio products, including home and portable radios, phonographs, television receivers, hearing aids and business machines.

Vastly increased quantities of the miniature tubes were manufactured by RCA Victor in 1944. First developed by RCA engineers and publicly introduced in 1940 in the camera-size "Personal Radio," these tubes made possible the walkie-talkies, the handie-talkies and other electronic devices for planes, tanks, and motor transports where weight and size of equipment are important factors.

### *First with High Power*

Creation of other special electron tubes has enabled engineers to construct a television transmitter to operate at frequencies up to 300 megacycles, that is, a wavelength of one meter. It is the first time a transmitter with a power output of 5,000 watts has been devised for



*Signal Corps Photo*

FLANKED BY SIGNAL CORPS MEN, GEORGE THOMAS FOLSTER, NBC NEWS REPORTER, BROADCASTS A DESCRIPTION OF FRONT LINE ACTION FROM THE RIM OF A BOUGAINVILLE FOX-HOLE.



U. S. Signal Corps Photo



Army Photo



LEFT: FISH-POLE LIKE ANTENNAS RISE FROM THESE TANKS AWAITING ORDERS ON A JUNGLE ROAD IN THE SOUTH PACIFIC. CENTER: A JEEP HALTS DURING ITS RECONNAISSANCE WHILE A RADIO MAN REPORTS TO HEADQUARTERS. RIGHT: MERRILL MUELLER (LEFT), NBC REPORTER, WATCHES AN ARMY OPERATION WITH GENERALS EISENHOWER AND BRADLEY.

television broadcasting on a frequency so high in the radio spectrum.

Another achievement of RCA Laboratories is a highly efficient optical system for projecting television pictures. This will have important applications in home television receivers to produce brighter pictures as large as 18 by 24 inches. It also involves a remarkable development — that of molding lenses from plastic material to reduce costs and to make the system economically practicable for home receivers.

With respect to television, the Report recalled that in January of this year the Federal Communications Commission issued a report proposing the assignment to television of 12 channels below 300 megacycles for commercial operation and a large band of higher frequencies for experimental work and future services.

"The management of RCA," the Report commented, "believes this proposal to be a constructive step toward the postwar development of television. It confirms the faith of RCA-NBC scientists and engineers that their years of television research and engineering have succeeded in developing satisfactory and practical television, of tried and tested standards. If the proposal is adopted, it will make possible the expansion of television as a service to the American people immediately upon the release of manpower and materials from war demands."

U. S. Navy Photo



MASKED AGAINST HEAVY WEATHER, A NAVY GUN CREW GETS ITS ORDERS OVER THE SHIP'S COMMUNICATING SYSTEM.

### *FM Is Aided*

In order to stimulate the progress of frequency modulation (FM) broadcasting, NBC announced in January, 1944, that its regular network programs would be made available to the FM stations of its affiliates, as new FM transmitting facilities become available.

During 1944, NBC broadcast a record-breaking total of 2,173 programs which originated in foreign countries. This was over 400 more than those broadcast in 1943.

RCA Communications, during 1944, handled 150,000,000 words of radio traffic, largely related to the war. New direct circuits were established with India and Gambia, British West Africa. Direct service with Paris, interrupted since the German occupation of France, was resumed late in the year. At the request of United States military authorities, and in cooperation with them, RCAC established and operated its own stations at Naples, Rome, and in Southern France.

Radiomarine Corporation of America continued in 1944 to maintain its leadership in production of marine radio apparatus, and in equipping and servicing merchant vessels. Shipments of apparatus for use by the Army, Navy and Merchant Marine increased 17% over 1943.

The Report recalled that on February 1, 1945, the RCA International Division was created. This Division places RCA in a more advantageous position to provide for anticipated expansion of the company's activities in foreign trade, including export to and sale in foreign countries of products manufactured by RCA, as well as products of non-affiliated companies which will be sold through RCA's foreign distribution channels.

### *Special Courses Organized*

RCA Institutes ended the year with substantially increased enrollment. Many of the new students are veterans of the war, preparing for jobs as radiotelegraph operators, technicians and maintenance men. A special course in television was attended by 300 engineers and employees of broadcasting stations.

Reviewing the progress of RCA operations in 1944, the Annual Report said: "Five years of global warfare have intensified the demands upon radio communications

as a military necessity. Radio, because of its speed, mobility and ability to cover any distance regardless of geographical barriers, is the greatest single factor of coordination of the widely scattered battle forces. Experience and leadership of the Radio Corporation of America as a 'Pioneer in Progress' have placed the company in the forefront of wartime advances in the use of radio and in the application of electronics."

Conversion of radio-electronics from war to peace will bring into public service such wonders as radar, television, electron microscopy, radio-frequency heating, among other developments, according to the Report.

### *New Services In Prospect*

"Return of peace," the Report stated, "will find new wartime inventions available for application to everyday life, offering new services of safety and comfort, entertainment and education."

As of December 31, 1944, RCA personnel numbered 38,435. Of this number, 51% were women and 49% were men. At the close of the year, 7,946 employees of RCA had joined the armed forces of the United States, and 77 of them had given their lives to their country.

It was disclosed that the RCA Retirement Plan, adopted by the Board of Directors and effective since December 1, 1944, has been approved by the Commissioner of Internal Revenue. Stockholders will be asked to approve the Board's action at the annual meeting of stockholders to be held May 1, 1945. As of February 1, 1945, more than 85% of those eligible had agreed to participate in the Plan, which assures employees life incomes upon retirement.

### *Year-End Statement*

Year-end financial statements contained in the Report show that:

Total current assets amounted to $190,629,493, compared with $189,312,778 at the end of 1943.

Total current liabilities, including borrowings under V-Loan Credit, were $133,251,944 at the year-end, compared with $138,977,334 at the end of the previous year.

Working capital (the excess of current assets over current liabilities) at December 31, 1944, amounted to $57,377,549, compared with $50,335,444 at the close of 1943. As of December 31, 1944, borrowings under V-Loan Credit totaled $55,000,000, a decrease of $10,000,000 during the year. On February 15, 1945, an additional amount of $20,000,000 was repaid, reducing current borrowings under the V-Loan Credit to $35,000,000.

After providing for dividends and adjustments, including the writing off against earned surplus of $3,671,931, representing the entire amount of goodwill shown on the balance sheet at December 31, 1943, the total earned surplus at December 31, 1944 amounted to $43,645,087, an increase of $2,039,436 over earned surplus at the end of 1943.

In a chart showing the growth of RCA during the past ten years, the report reveals the Company's gross income increased from $89,228,898 in 1935 to $326,421,913 in 1944.









TOP TO BOTTOM: 1. A NATIVE OF THE OLD WORLD EXAMINES THE ELECTRON MICROSCOPE, A MARVEL OF THE NEW WORLD. 2. A LINE-UP OF RADIO TUBES IS FEATURED IN A MOVIE OF RCA'S ELECTRONIC ADVANCES. 3. PENICILLIN DEHYDRATING APPARATUS BEING DEMONSTRATED AT RCA LABORATORIES. 4. FROM NBC'S NEWSROOM, COMMENTATORS COVER DEVELOPMENTS AT HOME AND ON THE BATTLEFRONTS. BELOW: RADIO EQUIPMENT FOR THE ARMY, NAVY AND MERCHANT MARINE ROLLS OFF RCA PRODUCTION LINES.





# NEW LIFEBOAT RADIO

*Compact Unit Has Own Power Generator and Is Automatic in Many of Its Operations—Balloon or Kite Holds Antenna Aloft*



By Charles J. Pannill,
*President,*
*Radiomarine Corp. of America*

AMERICA'S wartime shipbuilding program has intensified the development of radio equipment for use with the lifeboats carried by each vessel. Despite the fact that American Merchant Marine tonnage in 1944 was four times greater than in 1942, there has been a very substantial decrease in casualties because of improved safety devices and equipment.

For several years certain passenger vessels have carried radiotelegraph lifeboat equipment, but soon after this country entered the war the U. S. Coast Guard and the Federal Communications Commission issued regulations requiring lifeboat radio gear on cargo vessels. The advantages of this wartime move are self-evident.

After a ship has been abandoned and its personnel has disembarked in lifeboats, there arises the major problem of providing suitable facilities so that the lifeboat may be located by rescuing vessels. At the time of the emergency, the lifeboats may be far from the nearest land and the occupants may have only an approximate knowledge of their position. Through the use of a radio installation the morale of the men in the lifeboats is appreciably improved by the knowledge that contact has been made with rescuing agencies.

The first portable lifeboat radio sets designed to meet the Government regulations were battery operated transmitters using only a 500 kilocycle frequency. Such equipment left much to be desired because of its limited communication range and restricted power supply. In addition, because the equipment did not include a receiver, there was no way for the men in the lifeboats to know whether their distress signals had been intercepted by rescue craft.

In conducting its research and experiments with advanced models, Radiomarine Corporation of America proceeded on the basis that lifeboat apparatus should derive its power supply from a hand-driven generator, rather than from storage batteries, in order to insure reliable operation at any time. Furthermore, to insure maximum transmission ranges, a high frequency (short wave) was allocated by the Government in addition to the conventional distress frequency of 500 kilocycles. For most efficient transmission and reception, a suitable antenna system is needed, preferably one which is not restricted by the height of the boat's sailing mast.

### *Operation is Simple*

Because each lifeboat may not have a trained radio officer aboard, it is also important to design the equipment so that anyone, by following simple instructions, can use the equipment to summon aid. This calls for both two-way radiotelephone and radiotelegraph apparatus, all housed in a single unit. Moreover, the entire installation must be immune to weather conditions so that it will continue to function in spite of salt spray or heavy rain.

All of these requirements will be met successfully in the new Radiomarine model ET-8030 lifeboat radio. A compact water-tight binnacle contains a complete radio transmitter and receiver, a built-in hand-driven generator power supply unit, a telephone handset, a telegraph key, and a reel containing 300 feet of antenna wire. The radio transmitter may be used for either voice or code transmission, and delivers five watts of power to the antenna on frequencies of 500 kilocycles and 8,280 kilocycles. Using the lower frequency, average distances from 50 to 200 miles can be covered; the short wave facilities radiate a signal which can be picked up over distances of 1,000 miles or more.

### *SOS Flashed Automatically*

In addition to the conventional voice and code facilities, the transmitter incorporates a fully automatic cycle of operation. When the master switch on the panel is placed in the "Automatic" position and the hand generator is cranked, an ingenious, fully automatic, keying device transmits groups of SOS signals to summon aid and special "long dash" signals for radio direction finder bearings. The same keying mechanism also changes the transmitter frequency back and forth between 500 kilocycles and 8,280 kilocycles, while the generator is being cranked. This insures that the signals are radiated to cover both short and long ranges without further attention on the part of operating personnel.

When two-way communication is needed, the master switch is used to switch the radio receiver into the circuit. This receiver is pre-tuned to the distress frequency of 500 kilocycles and also can be tuned to sweep the short wave band from 8,100 to 8,600 kilocycles. Once communication with ships or shore stations has been established, the two way feature permits the drifting lifeboats to exchange information that will expedite rescue operations. In addition, because of the two-way radiotelephone facilities, the men in the lifeboats may communicate directly with one another and thereby plot their course so as to approach rescuing craft.

In the past the antenna system used with lifeboat radio installations has consisted of a short length of wire supported by the sailing mast, and fastened to the bow and

stern of the boat as an inverted "V" antenna. While satisfactory over short distances, such an antenna has limited the maximum transmission and reception range of the lifeboat apparatus.

This limitation, like the others previously mentioned, has been removed in the design of the outfit. Each Radiomarine installation is now equipped with a collapsed rubber balloon, hermetically sealed in a metal container, and a cylinder of compressed helium gas for inflating the balloon. The use of helium gas is an important step forward, as it eliminates the hazards of hydrogen gas sometimes used to inflate radio antenna balloons. After the balloon has been removed from the container, it may be easily connected to the helium gas cylinder and inflated in a few minutes to a diameter of four feet. Special strong, lightweight, antenna wire from the reel on the set is then attached to the balloon and the balloon released to a height of about 300 feet. The diffusion of gas through the balloon rubber fabric is extremely small so that the balloon will remain aloft for a week or more.

As a further precautionary measure, a collapsible box kite is supplied with each installation. This kite, which weighs only 13 ounces, may be quickly assembled to carry aloft 300 feet of antenna wire under wind conditions which would not be suitable for flying the balloon.

Each lifeboat installation is equipped with a compact watertight spare parts box which contains spare parts, tools, the helium cylinder, the balloon, and the kite. As a result, each lifeboat may be considered to have a complete radio station, which includes telephone and telegraph facilities, automatic transmission, built-in power supply, and an efficient antenna system.

The progress which has been achieved in the design of modern lifeboat radio equipment is exemplified by a comparison with one of the older models. For example, previous radio installations in the motor lifeboats of passenger vessels involved several units with a total weight of 450 pounds. Such equipment did not incorporate any short-wave facilities, required skilled radiotelegraph operating personnel, and contained no provision for radiotelephony. The new equipment weighs less than 160 pounds and includes all of the modern advances described in this article. It is so constructed that it may easily be transferred from one lifeboat to another simply by lifting the set through handles and bolting the housing to the floor of the other boat.



*The new lifeboat radio is shown here as it would appear if installed in a boat and ready for use. The reel which releases the antenna wire as the balloon floats aloft is in the lifted cover of the binnacle. Power is obtained by cranking the self-contained generator using the handles on each side of the case. All automatic operations for sending SOS and direction finding signals as well as two-way radiotelephone communication are controlled by the knobs on the sloping panel.*

## TRAMMELL ELECTED TO BOARD OF DIRECTORS

### *NBC President Succeeds General Dawes on RCA Board*

THE resignation of General Charles G. Dawes from the Board of Directors of Radio Corporation of America and the election of Niles Trammell, President of the National Broadcasting Company, to fill the vacancy, were announced Feb. 2 by Brigadier General David Sarnoff, President of RCA, following a meeting of the Directors.

General Dawes, former Vice President of the United States and Ambassador to the Court of St. James had been a Director of RCA since January 28, 1938.

Frank M. Folsom, Vice President of the Radio Corporation of America in charge of the RCA Victor Division, was elected a Director of the National Broadcasting Company, replacing General Dawes on that Board.

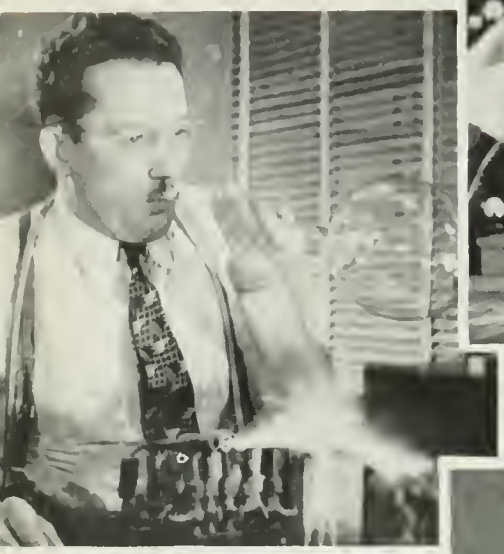
## RCA AND NBC HOSTS TO BRAZILIAN MISSION

### *Scientists Visit U. S. Research Centers to Observe Latest Developments in Science and Industry*

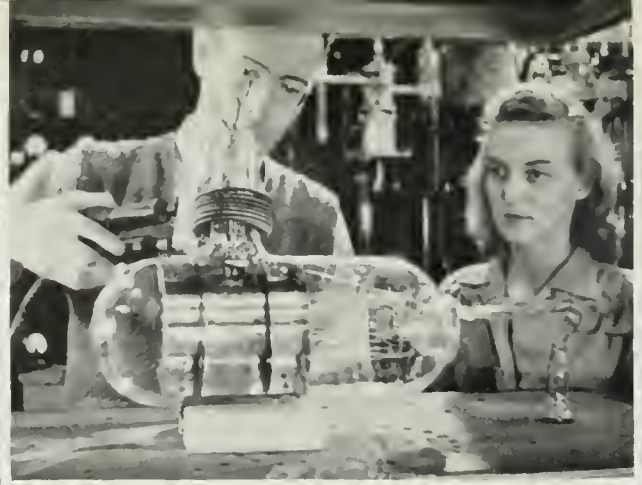
BRAZIL envisages a new great era of industrial expansion and is looking to the United States for first-hand information in preparing for this post-war development, Doctor Alano da Silveira, Professor of Metallurgy of the National Engineering School of Rio de Janeiro, disclosed at a luncheon for members of a Brazilian mission given by the Radio Corporation of America at the Hotel Waldorf Astoria. The mission, comprised of six professors of leading Brazilian scientific institutions, has been touring colleges and research laboratories in this country since December.

Dr. Harvey N. Davis, President of Stevens Institute of Technology, who was official host for the mission on its visit to the New York area, and Dr. James Rowland Angell, Public Service Counselor for the National Broadcasting Company, also spoke. The luncheon was followed by a tour of the NBC studios and a visit to the RCA Laboratories, at Princeton, N. J.

# SCENES FROM RCA LABORATORIES



THE GLASS-BLOWING ART IS USEFUL IN DEVELOPMENT OF NEW ELECTRON TUBES.



RADIO-HEAT AIDS IN THE MAKING OF AN EXPERIMENTAL ELECTRON TUBE.



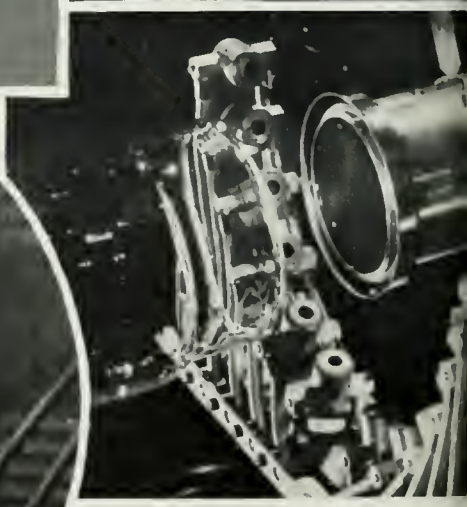
AN EXPERIMENTAL RADIO-FACSIMIL MACHINE.



THE "NEEDLE" OF THE ELEC-TRONIC SEWING MACHINE IS A LITTLE WHEEL.



DEHYDRATING PENICILLIN BY MEANS OF RADIO-HEAT.



RADIO-HEAT APPLIED THROUGH NO ZLES, WELDS GLASS AND METAL.



GRINDING LENSES FOR TELEVISION.



TESTING A MICROPHONE.



EXPERIMENTING WITH AN ICONO SCOPE, OR TELEVISION "EYE".

# Music Radiophotoed from Moscow

*FIRST PART OF A NEW MUSICAL SCORE BY SHOSTAKOVICH IS SPEEDED TO NEW YORK FOR PREMIERE ON NBC—TRANSMISSION STRIKES A NEW NOTE IN MUSICAL HISTORY*

IN THE FIRST transmission of its kind involving a major musical composition, the title page with part of Dmitri Shostakovich's latest score was flashed to New York directly from Moscow by radiophoto over the circuit of RCA Communications, Inc., in January. The transmission, which attracted wide attention, presages the speeding of compositions by the world's great musicians from one continent to another by radiophoto as soon as completed.

The newest score by Shostakovich, composer of the celebrated Leningrad Symphony, was brought to New York for its American premiere over WEAF and the network of the National Broadcasting Company on March 10. It is a composition for piano, violin and cello, entitled "Trio". Arrangements with the Russian composer for the broadcast and plans to hasten arrival of the score in the United States, were concluded by Samuel Chotzinoff, Manager of the NBC Music Division, immediately after he learned of its completion in Moscow.

Mr. Chotzinoff, who described the radiophoto transmission as "revolutionary in the realm of music," assigned three artists of the NBC Symphony Orchestra to participate in the premiere. Selected for the honor were Mischa Mischakoff, first violinst; Benar Heifetz, first cellist, and Earl Wild, NBC pianist and composer.

It was arranged for the three NBC musicians to visit RCA Communications headquarters, at 66 Broad Street, to see how the first page of "Trio" was transformed from radio signals to photo negative to positive print through the magic of the radiophoto system. They saw in the final result a perfect photographic reproduction of the original musical score in Shostakovich's own hand, and this was used in their preparation for the radio premiere.

### *Two Leningrad Graduates*

For two of the musicians, Mr. Heifetz and Mr. Mischakoff, the occasion took on added significance because of their musical schooling at Leningrad Conservatory, where Shostakovich more recently studied. In addition, both had performed at the Moscow Opera, where his latest work had its Russian premiere.



LEFT: OPERATOR INSERTS NEGATIVE FILM IN RADIOPHOTO RECEIVING UNIT. BELOW: SECTION OF SHOSTAKOVICH SCORE IS INSPECTED AFTER RECEIPT FROM MOSCOW.

Rarely, they pointed out, did musicians have the good fortune to work from the equivalent of an original score by a great composer who also happened to be a compatriot and a fellow alumnus of a school 4,000 miles away.

The nearest approach to the speed of the radiophoto transmission—and itself a record-breaking event in musical history—occurred when a microfilm of the great Shostakovich Leningrad Symphony was flown to this country for its American premiere over the NBC network on July 9, 1942.

### *Score Sent in Sections*

In actual transmission time, it took twenty-four minutes for the first page of the latest score to come from Moscow over the RCA receiving radiophoto machine. To facilitate handling, the photograph of the composition was sent in four sections of six by eight inches each, and these were cut into a mosaic of standard musical page size for the positive print. The microfilm air-mail transit of the Leningrad Symphony took nearly three days, and musical scores carried by ordinary mail often require several weeks to travel that distance.

In addition to the Moscow circuit, which has been in operation since July, 1941, the RCA radiophoto system works directly between New York and Cairo, London, Stockholm, Berne and Buenos Aires; and between San Francisco and Melbourne and Honolulu on the Pacific side.

Before the war, RCA Communications operated radiophoto circuits with Berlin, Tokio, London and Buenos Aires, the first commercial service having been established by the Company on April 30, 1926.

While the primary function of the system in wartime has been the rapid transmission of news photographs from the various theaters of fighting, the circuits can be used to flash radio facsimiles of important documents, charts and drawings.

# LARGE-SCREEN TELEVISION

*RCA Demonstrates Advanced Model—Four Technical Developments Make Possible Brighter, Clearer Pictures on 16 by 21 Inch Screen*

AN advanced development model television receiver reproducing pictures brighter, clearer and five times larger than were obtainable on pre-war sets was demonstrated March 15 by the RCA Victor Division of the Radio Corporation of America, with the cooperation of the National Broadcasting Company.

A special program of live talent and films presented by NBC was viewed on the receiver model, which features a new type of screen, 16 x 21⅓ inches, made of surface-treated plastic. In a brief talk preceding the demonstration, Dr. C. B. Jolliffe, Vice President in Charge of the RCA Laboratories, explained technical details of the receiver.

Bill "Bojangles" Robinson headed the list of entertainers on the half-hour variety show. In addition to the veteran tap dancer, NBC presented a dramatic sketch, "Birthday," featuring Jimsie Somers, 8-year-old television actress; Frances Dee, Philip Foster, and Ed Jerome, all well known to stage and radio. Russell Patterson, artist, sketched models as they paraded before the television camera, and two film shorts, showing various athletic events and the U. S. landing on Corregidor, completed the entertainment.

According to Frank M. Folsom, Vice President in Charge of the RCA Victor Division, television sets of the type demonstrated will not go into production until wartime restrictions on manpower and materials are removed. He said that the company expects to make large-screen receivers available within about one year after civilian production is resumed.

Console models, containing projection-type television, FM and standard broadcast receiving facilities, Mr. Folsom added, will cost approximately $395. RCA Victor will also have several models equipped with direct viewing picture tubes, and at least one table model priced at about $150.

The large screen television receiver, Dr. Jolliffe said, was made possible by four pre-war technical developments by RCA scientists and engineers. These include an im-







THREE STAGES OF TELEVISION RECEIVER PROGRESS: LEFT—RECEIVER WITH A MECHANICAL SCANNING DISK, USED IN THE LATE 20'S. BELOW AT LEFT —PRE-WAR MODEL GIVING 7 BY 9-INCH PICTURE. BELOW RIGHT—RCA'S ADVANCED DEVELOPMENT MODEL PRESENTING A 16 BY 21-INCH PICTURE.

proved high voltage projection tube; a unique optical system of high efficiency; a new type of plastic viewing screen and an automatic frequency control circuit.

Some of these principles, Dr. Jolliffe pointed out, were used in RCA's demonstration of large-screen theater television at the New Yorker theater in New York in 1941. The entry of the United States into the war and the immediate conversion of RCA Victor facilities to war production halted the commercial development of large-screen home television receivers embodying these developments.

Large-size reproduction of the images on a screen built into the receiver cabinet is made possible primarily by a special optical system developed by a group of scientists and engineers working under the supervision of Ioury G. Maloff, of the RCA Victor Division, and David W. Epstein, of RCA Laboratories.

The optical system, Dr. Jolliffe said, consists of a bowl-shaped mirror and molded plastic lens of special design which delivers to the back of the viewing screen about six times as much light as could be obtained with a conventional F:2 movie projection lens. In the model demonstrated, the cathode ray receiving tube is mounted face downward in the lower part of the cabinet, with the bowl-shaped mirror below it and facing upward. Light from the face of the tube is reflected upward from the mirror through the plastic lens to a flat, inclined mirror near the top of the cabinet, from which it is thrown upon the back of the viewing screen. The vertical mounting makes it possible to install the entire receiver and optical system in a cabinet not much larger than a standard radio console.

### *Special Cathode-Ray Tube Used*

The second RCA development which contributes to the exceptional brightness, clarity, and high definition of the large-screen pictures is a special high-voltage type of cathode ray tube. This tube, designed to operate at 27,000 volts, produces a much brighter original image on its face than could be obtained with the lower voltages used for the purpose before the war. The new tube has a diameter of five inches.

The third advance which enhances the quality of the pictures is an automatic frequency control developed by RCA Victor engineers, which eliminates picture distortion caused by "noise" interference.

Augmenting these improvements, the fourth advance introduced in the demonstration was RCA Victor's new translucent plastic viewing screen. Special features incorporated in the design of the screen provide even distribution of light over the image area and proper distribution of transmitted light within the normal viewing angle. The screen thus assures a picture of maximum brightness and natural light contrasts.

Dr. Jolliffe emphasized that the receivers exhibited were development models, and were being demonstrated to "afford a glimpse into the future.

"Until Victory is won," he said, "our resources and facilities will be devoted completely to the war effort. In looking forward to peace, we look forward to conversion of our research and manufacturing facilities to the production of radio and electronic equipment — which, of course, includes television — to give new and improved services to the American public."

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# PRESS APPLAUDS LARGE-SCREEN TELEVISION

COMMENTS appearing in the press after representatives of major publications in the United States had witnessed the demonstration of RCA's large screen television receiver were universally favorable.

"Compared to pre-war models," said the *Associated Press*, "its reproduction was remarkable. Pictures actually could be described as rivalling the home movie in detail and brilliancy as well as size."

*The International News Service* said, "Remarkably clear . . . presaged a limitless horizon for the world of tomorrow, visible with the turn of a dial in the comfortable surroundings of your own living room."

Arnold Blum, *PM:* "It was far superior to anything seen before the war or to anything visible today on picture-tube sets. There was only microscopic distortion, even from acute angles and then only rarely; the picture was brilliant and the definition excellent. It was as good in these respects as a Grade A home-movie."

Ben Gross, *New York Daily News:* "What I saw was a tremendous improvement over all the old pre-war television showings. It was possible to sit back some distance from the receiver and enjoy the presentation without eye-strain."

*New York Herald Tribune:* "The images . . . were bright enough to be seen in clear detail from all parts of the demonstration room which was about twice the size of an average living room."

*Time:* "Last week in Manhattan, RCA Victor demonstrated its postwar answer (to demands for large-screen television home receivers). . . . The RCA set produced a clear, bright picture."

*New York Times:* "The first definite indication of the television to be seen immediately after the war is provided by the Radio Corporation of America in a receiver, identified as 'an advanced development model.' To mince no words, it offers the largest and brightest pictures yet shown the layman."

*Editor & Publisher:* "RCA's program was topped off with a playlet televised from the studio so cleverly that many in the audience believed it to be a movie film."

# Studies In Sound

*EVERY MODERN FACILITY FOR RESEARCH INTO THE VAGARIES OF ACOUSTICS IS AVAILABLE AT RCA LABORATORIES*



By Dr. Harry F. Olson
RCA Laboratories,
Princeton, N. J.

ROOMS with sound characteristics that would both delight and dismay housewives and Swiss yodelers are only part of the scientific marvels that comprise the Acoustic Laboratory of the new RCA Laboratories at Princeton, N. J. One of the rooms is so devoid of echoes that the blood stream in a visitor's ears hisses ominously in the eerie silence of the place; a second is constructed in such a manner that a single burst of sound swells into a cacophony of noise.

These unusual compartments, termed Free Field Sound Room and Reverberation Chamber respectively, together with a Sound Stage, a Magnetic Laboratory, a Living Room which can be adjusted to become either "dead" or "alive", and a Field Laboratory used for the outdoor testing of sound systems designed for operating in the air and under water, make it possible for RCA experts to carry out a wide range of precision tests on newly developed equipment.

Acoustics, the science of sound behaviour, is the very heart of radio reproduction and as such plays a basic role wherever loud speakers and microphones are used. As a direct result of this unremitting search for better materials, methods and component parts, the public has enjoyed a continuous improvement in the tone quality of radio receivers. Other important applications benefited by this specialized branch of research are phonographs, sound motion pictures, television, public address systems, world wide communications and many special wartime projects on land and sea.

Possibly the most interesting of all rooms in the group, in appearance and use, is the Free Field Sound Laboratory.

The expression "free field", in this instance, means freedom from reflections, an essential condition in the testing of electro-acoustic transducers, better known as microphones and loud speakers. And in the design of this Free Field Laboratory, RCA Laboratories' experts have reached as close to perfection as the most sensitive instruments can determine.

### *An Oddly Designed Room*

Acoustic engineers will tell you that the most obvious and direct solution of this problem of controlled reflections would be to make the measurements out of doors at a great distance from the earth and from any hill, house, or other reflecting surface. But the elements, natural and man-made, are unpredictable noise makers and only by conducting the outdoor tests at great elevation could these objections be overcome. For these reasons a free field sound room becomes an almost indispensable part of an acoustical laboratory.

Designers of the room commenced with one basic objective, viz., to reduce to a negligible amount all reflections from the boundary surfaces. This called for a room of considerable size with walls constructed of materials that would absorb instead of reflect sound waves. The combination of these two factors resulted in an acoustic measurement laboratory which immediately impresses the casual visitor as a creation straight out of the Walt Disney imagination.

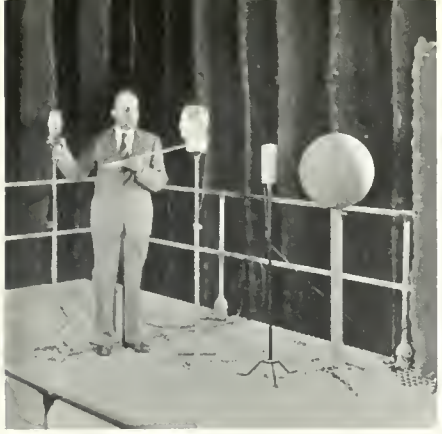
### *Walls Heavily Baffled*

In constructing the room, engineers began with floor dimensions of 48 by 36 feet surrounded by walls 36 feet high. Inside these outer limits, one foot from walls, floor and ceiling, another structure was built of ozite one inch thick. Then a series of ozite strips, called baffles, eight feet in depth and spaced two feet apart were hung at right angles to the room surfaces. And finally, sandwiched between the baffles, the builders added still other baffles of the same material, four feet in depth. With these construction details completed, the laboratory measured 32 feet long, 20 feet wide and 20 feet high. A platform of steel grillwork 12 by 24 feet, elevated 11 feet above floor level and supported on cushioned legs to absorb vibration, provides working space for personnel and test set-ups.

How successful the acoustical engineers were in their execution of the room is best indicated by tests made after its completion. Meas-

OUTDOOR TESTS OF SOUND EQUIPMENT ARE CONDUCTED AT THIS FIELD LABORATORY AT RCA LABORATORIES, PRINCETON, N. J.







LEFT: DR. H. F. OLSON ARRANGES APPARATUS FOR ACCURATE TESTS OF AN ARTIFICIAL VOICE IN RCA LABORATORIES' FREE-FIELD SOUND ROOM. RIGHT: IN THIS ROOM ENGINEERS WATCH INSTRUMENTS WHICH RECORD THE QUALITY CHARACTERISTICS OF A LOUDSPEAKER UNDER TEST.

urements showed that less than three tenths of one percent of the sound energy striking the baffled and padded walls is reflected. This trace of reflected energy, while undesirable, represents such a small part of the total that any error it might introduce into actual tests would be less than the error of good electrical measurements.

Measuring equipment used in conjunction with the free field sound room is located in the adjoining laboratory. The apparatus includes means for measuring the response frequency, power frequency, and directional characteristics of electro-acoustic transducers. Signal lines connect the free field sound room with the adjacent laboratory, as well as all other rooms in the Acoustic Laboratory.

### *Noise Absent at Night*

Spurious noises reaching the room from the outside are only slightly above the threshold of hearing even when the laboratories are in normal operation, but at night, with the shops closed down, the noise level decreases to 0 db, the absolute threshold of the normal ear. The room is heated by hot air forced through openings in the floor but the thermal insulation is so complete that even on the coldest days, the heating system must be operated only one third of the time to hold the temperature within a 3 degree variation.

Many complex factors influence the collection of sounds by microphones and the dispersion of sound by loudspeakers. Therefore, after either form of these electro-transducers has been developed, the next step is a test under actual operating conditions. These tests require a sound stage with acoustic characteristics that can be altered as desired.

The RCA Laboratories include such a stage, 48 feet long, 36 feet wide and 24 feet high. Two large monitoring rooms on the side give an unimpeded view of the stage through sound proof windows.

### *Walls and Ceilings Padded*

The walls and ceiling of the sound stage are finished in one-inch Absorbex, backed by four inches of rock wool blanket. The stage floor, for practical reasons, is covered with asphalt tile with practically no absorption. An abuse-resisting wainscot extends up four feet from the floor. The reverberation time of 0.4 second is quite low and is about one-half that recommended for a normal broadcast studio of this volume (40,000 cubic feet). The reverberation time is made low so that flexible acoustic characteristics may be obtained. For example, in sound motion pictures and television, the standard practice is to build sets upon a sound stage with very low reverberation time. Under these conditions, the acoustics of the collected sound is determined by the set. Added realism is attained by this expedient because the acoustics of the collected sound corresponds to the picture depicted on the screen. For tests under normal broadcast acoustic conditions, the reverberation time of the sound stage may be increased to optimum values by introducing reflecting surfaces on the walls. In this case "V'ed", polycylindrical or other dispersing surfaces may be used. This sound stage provides a means for testing the acoustical properties of these surfaces.

A low noise level is another essential requirement of a sound stage. The noise level in the sound stage when the laboratories are in normal operation is 20 db.

The sound stage is designed so that it may be employed as a small theater for the reproduction of sound. For these tests, the room may be "livened" by increasing the reverberation time. This is done by introducing reflecting surfaces along the sides and in the ceiling.

Radio receivers and phonographs, as used in the home, constitute the largest number of complete sound-reproducing systems. For this reason, the performance of a loud speaker in a relatively small room is an extremely important problem.

### *Duplicates Living Room*

The living room laboratory is designed to be the acoustical equal of the average living room. It is 24 feet long, 20 feet wide, and 8 feet 6 inches high. Audio frequency signal lines connect the living room with measuring equipment permanently installed in other parts of the Acoustic Laboratory. These lines are essential when it is desired to obtain objective data on response frequency, non-linear distortion, spatial distribution, intensity level and transient characteristics of sound reproducers operating in the living room.

Dust-free rooms are highly desirable for the assembly of the

magnetic structures of microphones, loudspeakers and other electro-acoustic transducers. In these chambers at RCA Laboratories, all incoming air is carefully filtered to remove suspended matter and each room is maintained at a slightly higher atmospheric pressure than the adjoining room. This precaution definitely bars the way to the entrance of dust particles which might contaminate the delicate equipment being assembled.

The two remaining rooms in the Acoustic Laboratory suite possess characteristics almost diametrically opposite. One, the live room, is used to study reverberations or echos. Here in a space 24 feet by 18 feet with a 13 foot ceiling, engineers investigate the sound absorbing properties of different materials. So "alive" is the chamber that a sound will rebound back and forth from one surface of the room to another for upwards of four seconds.

Contrast this with the sound proof room which is so well insulated that loud speakers under test may be operated at very high levels without annoying workers in adjacent rooms. Its walls are built of double masonry and sealed with two heavy doors. Here again audio frequency signal lines lead to other parts of the laboratory for convenience in making measurements.

### *An Outdoor Laboratory*

But standard radio and public address practice also calls for the outdoor use of certain types of sound instruments. To test these products, a field laboratory was erected on relatively open, flat ground some distance from the main laboratory structure. Nearby, a hoist provides means for lifting equipment 40 feet above ground, when such a position is needed to simulate actual operating conditions.

Occasionally it becomes necessary to conduct studies of sound propagation and reception under water. To make this possible and thereby complete the comprehensive facilities of the laboratory, a pond one fifth of an acre in area and 20 feet deep in the center was created artificially from nearby springs. A mud bottom and sloping banks reduce reflections from these submarine surfaces. Apparatus needed for these subaquaeous tests is set up in the field laboratory building and fed from lines brought out to the pier overlooking the pond.

Out of this galaxy of rooms, the like of which would never be found nor wanted in a dwelling, have come fundamental improvements in sound pick-up and reproducing equipment which will be embodied in the design of RCA postwar products intended for the entertainment and service of the public. Only through these intensive, precise analyses of the behaviour of intangible sound waves is it possible for science to attain the high degree of perfection in loud speakers and microphones that will typify the sound systems of tomorrow.

## RCAC Reopens Circuits

Reopening of direct radiotelegraph service between New York and Brussels on March 4 was followed the next day by resumption of service between this country and the Netherlands. In making the announcement, Lieutenant Colonel Thompson H. Mitchell, Vice President and General Manager of RCA Communications, Inc., explained that both circuits had been closed since the German occupation of the respective countries. At present, only Government and press messages will be handled but commercial service is to be resumed later.

The Brussels circuit, operated at its foreign terminus by the Belgian Telegraph Administration, was the third to be completed by RCA Communications with liberated European capitals in eight months. Direct radio connection with Rome was resumed June 13, 1944. The New York-Paris circuit was returned to use on September 16.

The Netherlands terminus of the restored circuit is being operated, as before the German invasion, by the Netherland Postal and Telegraph Administration.

Nationals of the two countries located in New York expressed their appreciation of the restored services. Henri Fast, of the Belgian Information Center of New York said: "This is a visible outside demonstration of the liberation of Belgium—for a country is free only when it can communicate freely and quickly with the rest of the world."

Ambassador A. Loudon, Netherlands envoy to the United States, filed the first message over the completed circuit to his native country. It was addressed to General Kruls, Chief of the Netherlands Military Government, and said in part: "To be able to communicate again directly and openly with the homeland is a source of great joy. The Dutch living abroad are grateful that the days of separation are over and that the magic of radio enables them to feel and come closer to their compatriots who have sacrificed so many and so much in their dogged perseverance and resistance and who have suffered so deeply through the cold, disease and starvation."

## JOSEPH V. HEFFERNAN ELECTED VICE PRESIDENT

Election of Joseph V. Heffernan as Vice President and General Attorney of the Radio Corporation of America was announced by Brigadier General David Sarnoff, President of RCA, following a meeting of the Board of Directors on April 6.

Mr. Heffernan, who was appointed General Attorney of RCA by the Board of Directors on January 2, 1945, joined the company in June, 1940, after having been associated for five years with the New York law firm of Cahill, Gordon, Zachry & Reindel, General Counsel of RCA. From 1937 to 1939, he was manager of the firm's Washington office. On leave from RCA, Mr. Heffernan served as a Lieutenant with Air Force Atlantic Fleet, United States Navy, from 1942 to 1944.

Born in Washington, Indiana, on December 23, 1905, Mr. Heffernan was graduated from St. Louis University and received an L.L.B. degree from Indiana University.

# Radio and Films In India

*Fazalbhoy, of Bombay, Reports Great Prospects for Extension of Broadcasting and Motion Pictures — Sees Vast Opportunities for Education.*

INDIA's film industry has plans for a great step-by-step expansion after the war to help educate the country's illiterate masses, according to M. Akbar Fazalbhoy, managing director of RCA Photophone Equipments, Ltd., of Bombay, who recently came to the United States in the interest of Indian motion picture producers, distributors and manufacturers.

Mr. Fazalbhoy, who was a member of the Indian delegation at the International Business Conference, held at Rye, N. Y., in January, reported that RCA equipment will play an important part in the project, which envisages the building and operation of 1,000 additional film houses in India during the next four years. Eventually, he disclosed, the Indian film industry hopes to have 10,000 motion picture theatres and touring units to bring films to all urban and rural sectors of the country.

At the present time, Mr. Fazalbhoy declared, India's 400,000,000 men and women are served by less than 2,000 film houses, as compared with 17,000 in this country of a third that population. The plan calls, first, for an expansion to 3,000 cinemas; then an increase to 5,000 in another four- or five-year period, and a further boost of 5,000 possibly within fifteen years after the war.

Also incorporated in the expansion, he revealed, are plans for the increase of motion picture production to service these show places. It would require the annual production of 300 feature films, 104 instructional shorts and 52 weekly newsreels. Each film house program, as now outlined, would consist of a feature film, a short, and a newsreel.

In carrying out this program, India needs the help of the American motion picture industry, Mr. Fazalbhoy said. In addition to training Indian technicians, skilled American experts could assist in setting up factories in India for the manufacture of everything required for the production and projection of motion pictures.

### *Task of the Film Industry*

The Indian film industry, according to the visitor, recognizes that it has a task to perform in bringing Indian art, learning, and culture not only to its own people but to people in other countries throughout the world. There exists a need to offset inaccurate and perhaps strange notions of India harbored by people in other countries. For this reason, it is planned to produce films in the English language for international trade.

The progress of visual education in this country, Mr. Fazalbhoy declared, illustrates the vast opportunities for the education of the Indian masses by use of motion pictures in school systems throughout that country.

Though the Indian film industry is planning for greater post-war expansion, it was pointed out that India is now the second largest producer of films in the world, second only to the United States. Production amounts to about 150 films a year, compared to 400 produced in America and 60 in Great Britain.

Service men of the U. S., who are stationed in India are showing much interest in the India of today, Mr. Fazalbhoy reported, describing it as an interest that will be communicated to their families at home. In this connection he disclosed, a film is now in production at the Temple of Art in Bombay which he feels will be a contribution to Indo-American understanding. This film is "The Story of Dr. Kotnis," a saga of a young man who left his obscure little Indian town to serve humanity in war-torn China.

### *American Films Featured*

The popularity of American films in India is growing, and some are playing to turn-away crowds, Mr. Fazalbhoy said that Indian producers are looking forward particularly to the making of technicolor films.

But he described the theater equipment situation as deplorable in India, asserting that only a scant amount has been available for civilian trade. One of his missions to this country was to set up with American governmental agencies new theater equipment quotas for export to India.



M. A. FAZALBHOY (CENTER) AND A FRIEND ARE SHOWN THROUGH NBC'S TELEVISION STUDIO BY FRED BATE, MANAGER OF NBC'S INTERNATIONAL DIVISION.

ARCHITECT'S DRAWING OF NEW RCA HEADQUARTERS IN BOMBAY, INDIA.



# COMMUNICATIONS WITH WINGS

*Aviation Radio, After 25 Years of Research, Becomes Indispensable In Modern Warfare—Many Improvements Are Secret*



By H. M. Hucke

*Manager, Aviation Radio Sales*
*RCA Victor Division*

AS the United Nations intensify their offensives against enemy forces, with swarms of bombers and supporting fighters daily growing in number, aviation radio becomes increasingly important in military strategy and tactics. Without adequate radio equipment to guide the planes and direct their activities, the extent of the powerful blows would be severely limited. With these aids, difficult missions are carried out with complete success.

And yet, startling as the development of aviation radio has been during wartime, behind today's accomplishments are 25 years of unceasing research.

While records show that both radio and aviation had their beginnings in the earliest days of this century, nearly two decades passed before these great mediums of communications were united for practical use. The Wright Brothers made aviation history at Kitty Hawk in 1903 and Marconi transmitted the first trans-Atlantic wireless message in 1901, but little progress was made in practically adapting radio to planes until 1919, the year the Radio Corporation of America was founded.

Radio transmission and reception in planes had been tried earlier but only in telegraph code. At the end of World War I, the use of two-way voice communication was in its first stage of development. Engineers faced severe handicaps. Radio equipment was bulky and heavy; planes had little available space and less weight-carrying ability, and the range of the most powerful transmitting sets was extremely limited. But, as plane designers improved their craft, radio kept pace until today the communication needs of the aviation industry can be met to the highest degree by radio apparatus tailor-made to the requirements, whatever they may be. How the two vital communication mediums continued to march ahead in step during the past quarter century is best told in a brief history of air transportation.

In the early 1920's, the U. S. Post Office Department began to carry mail between a limited number of Eastern cities. At first the pilots operated their routes without the aid of radio but shortly, radio equipment salvaged from the war, was installed. Results were only fair.

### *Pioneer Tests in 1919*

Radio first demonstrated its place as an adjunct to plane travel in May 1919 when the Navy flying boat NC-4 flew the Atlantic via Newfoundland and the Azores. Through its transmitting and receiving equipment, the big plane maintained communication with ground stations on both sides of the Atlantic and with Navy destroyers and other vessels stationed along the water route. One of the radio operators assigned to that history making hop was Harry Sadenwater, now engineering products sales manager of RCA's New York Regional Office.

Results of the flight pointed up the necessity for a network of ground stations to make up for the low power of the plane's transmitters and the use of low frequencies which travelled only short distances. Eventually, the development of short waves, which reflect from the Heaviside layer, made it possible to cover great distances with a minimum of power. This was demonstrated in 1925 when the Navy dirigible *Shenandoah*, equipped with short wave apparatus, communicated with amateurs in all parts of this country as it soared from coast to coast.



AIRCRAFT RADIO EQUIPMENT IS SUBJECTED TO ARCTIC WEATHER IN A CHAMBER COOLED TO —40°C.

Two years later, Maitland and Hegenberger flew from San Francisco to the Hawaiian Islands with the aid of long wave radio beacons. These "radio lighthouses" were the forerunners of the system installed by the Department of Commerce on all domestic airways in 1930.

After the Post Office Department contracted with commercial airlines to carry the mail, additional compensation was provided the carriers to cover the cost of installing two-way radio equipment. This resulted in the installation of complete two-way voice systems on most of the routes. A few continued to use code, a practice that is retained today on trans-oceanic lines.

### *Voice Transmission Favored*

On domestic routes voice transmission was preferable. It gave the pilot man-to-man contact with the dispatcher and weather man on the ground. It also increased the payload by eliminating 160 pounds of radio operator.

Up to the time the commercial airlines entered the picture, the development of aviation radio had been carried on by the U. S. Signal Corps, the Navy and to some extent by amateurs and an occasional adventurous small manufacturer. These Government departments were kept short-handed by the small appropriations of a peace-minded Congress and like the bulk of the aviation pioneers, were

forced to get along with the salvaged left-overs from World War I.

Airmail income, however, stimulated the airlines. They had sufficient funds even in the depression years of 1931-1935 to maintain substantial radio laboratories. For this reason, the period from 1929-1940 might be called the "Airline Era." Radio designs and procedures progressed; Congress opened its purse to the Bureau of Air Commerce and its successor, the Civil Aeronautics Authority, and many worthwhile radio refinements resulted.

### *Radio Compass Widely Used*

One of these new developments, the long-wave radio beacon, has been mentioned. Others were the two-way voice system, the radio compass, the shielded loop and the automatic direction finder.

At first the two-way voice system had only a single channel. This was inconvenient due to the necessity of having separate frequencies for day and night. With only one channel, pilots were forced to stop at daybreak and again at dusk to retune transmitter and receiver. Consequently, the two-channel quick frequency shift was a natural advance in design. Later the airline traffic increased so greatly that many frequencies were needed in crossing the continent. Today, ten quick shift channels are used in both aircraft and ground stations.

The radio compass provided means for homing on broadcast stations or radio beacons. Private flyers who flew off airway routes adopted it at once because of its value in using broadcast transmitters as guides. The Army became still another enthusiastic booster for the compass and for the same reasons.

Airlines remained satisfied with the beacon system until RCA first suggested that they try the anti-static qualities of the metallically shielded loop which had been developed by the Radio Marine Corporation of America for use on steamships. Tests were successful and the Civil Aeronautics Authority, in 1937, made its use mandatory as a safety feature. This step brought aural-null direction finding into use on all airlines.

About that time RCA and Sperry Gyroscope Co. combined their talents to develop the automatic direction finder. This soon found favor with the airlines, since it gave an immediate azimuth indication without changing the course of the airplane as was necessary with the radio compass. It also retained the anti-static properties of the metallically shielded loop without the necessity for turning it by hand.

### *Sky-wave Effect Reduced*

One of the first refinements in the radio beacon was the Adcock system, which greatly reduced sky-wave course distortion. The Adcock also had a sharper cone of silence indication over the station and it became necessary to develop a more positive system for indicating when the pilot had reached his destination. Fortunately, the ultra-high frequencies had been developed by that time and a 75-megacycle ground transmitter which sent a vertical beam upward solved the problem. The airplane receiver was relatively simple except that its output was arranged to turn on a light when the airplane passed through the beam.

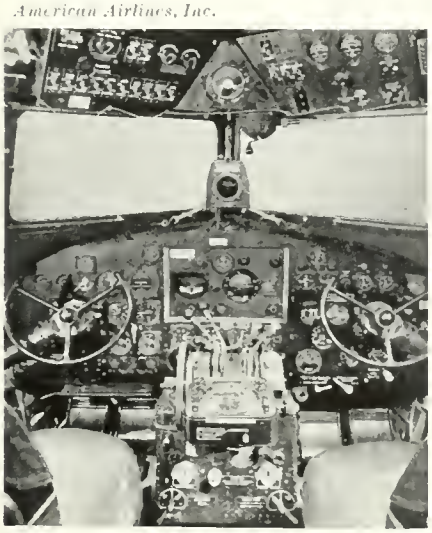
During the early part of the "Airline Era" the manufacturers, airlines and Army and Navy made various efforts to develop equipment for testing radio apparatus under simulated altitude, temperature, vibration and humidity conditions. Such efforts are still in progress, but in 1939 the C.A.A printed Manual 16 which represented the combined thinking of the various interests. This manual set certain standards by which good aviation equipment could be judged and represents a contribution as important to the art as a new transmitter or receiver.

Landing by instruments on a fog-bound airport has been the subject of much research since the beginning of the "Era." Many systems have been proposed and all found wanting until comparatively recently. Practically all systems consisted of a localizer beam which gave indications to the left and right of the runway and a glide path which gave an up-and-down indication to bring the airplane down a slanted path which ended at about the center of the runway. The localizer beam was developed early, but the glide path was delayed until ultra-high frequency techniques were advanced sufficiently to provide a satisfactory beam path. This has been achieved and will be used by the commercial services after the war.

### *Radio Altimeter Developed by RCA*

Just prior to World War II there appeared two developments which we will hear more about when the war is over. The first of these is the radio above-terrain altimeter. During the war, RCA has advanced this device tremendously and its use commercially after the war is assured. The second is the ultra-high frequency omni-directional radio range. This RCA development is destined to reappear in new forms after the war and may replace all existing types of range systems.

*American Airlines, Inc.*



INSTRUMENT PANEL OF TRANSPORT PLANE SHOWS RADIO COMPASS CONTROL APPARATUS IN THE LOWER FOREGROUND. BELOW: RCA VICTOR'S FLYING LABORATORY TAKES OFF FOR ANOTHER TEST OF AIRCRAFT EQUIPMENT.



# "INVASION" BY RADIO

*Twenty-Three RCA Short-Wave Transmitters Have Been Shipped Abroad to Play Important Part in the War of Words*

THREE shortwave radio transmitters completed and shipped recently by the RCA Victor Division were the last of twenty-three 50-k.w. transmitters supplied by the company during the past two years to carry on the war of words against Germany and her satellites. These shipments are believed to exceed in number and power classification the output over a similar period of any manufacturer in the history of radio.

First to "invade" the axis and satellite nations, with words for weapons, short-wave radio transmitters helped to pave the way for the physical invasion. Keeping up a constant bombardment of news, education, and counter-propaganda heard and felt around the world, they helped and are helping to consolidate Allied gains and facilitate Allied victories.

Among the RCA transmitters now on the air are seven operated for the Office of War Information, including five on the East Coast of the United States, one on the West Coast, and one in North Africa. Three of the East Coast stations are being operated for OWI by the National Broadcasting Company, a subsidiary of RCA; the other two by the Columbia Broadcasting System. The West Coast station is being operated for OWI by Associated Broadcasters.

First of the list of 23 stations to be installed was a transmitter purchased by the Brazilian government for Radio Nacional, government-operated station at Rio de Janeiro, which went on the air during the winter of 1942-43. John Dawson, RCA field engineer, supervised the installation.

Next came Radiodiffusion Nationale Belge (the "Voice of Free Belgium"), at Leopoldville, in the Belgian Congo, and Radio Brazzaville, operated by the French National Committee for Liberation, in Brazzaville, French Equatorial Africa. These transmitters went on the air in the spring of 1943, Leopoldville preceding the Free French station by about a month. The Leopoldville installation was supervised by Walden Shaw, Brazzaville by Paul C. Brown. Both are RCA field engineers.

Development of this type of transmitter was begun about a year before Pearl Harbor, when the increasing importance of high-power international broadcasting became apparent.

Rectifier, audio, and control circuits of the 50-kilowatt RCA shortwave transmitter are much like those developed for the RCA standard broadcast transmitter of the same power rating.

The inclusion of two separate and complete radio frequency channels is a feature of the shortwave unit which experience has proved valuable as a means of quickly setting up or changing frequencies to any point in the range from 6 to 22 megacycles.



RADIO TRANSMITTERS ADD THEIR VOICES TO THE WAR OF WORDS DIRECTED AGAINST GERMANY.

## SCHMIT AND BEERS MOVE UP IN RCA VICTOR

Appointment of D. F. Schmit as Director of Engineering was announced recently by Frank M. Folsom, Vice President in charge of the RCA Victor Division. Mr. Schmit, formerly assistant chief engineer, will fill the post vacated by Dr. C. B. Jolliffe, now Vice-President of the Radio Corporation of America in charge of RCA Laboratories.

Mr. Folsom also announced the appointment of George L. Beers as Assistant Director of Engineering in charge of Advance Development. He was formerly on the engineering administrative staff.

LEFT: TRANSMITTER PANELS AND CONTROL DESK AT LEOPOLDVILLE, BELGIAN CONGO. RIGHT: ANOTHER RCA 50-KILOWATT TRANSMITTER IS OPERATING FROM RIO DE JANEIRO.



# TUBES IN MINIATURE

*Development of Tiny Electron Tubes Forecasts Design of Smaller Radio Sets and More Compact Television Receivers.*

DEVELOPMENT of a complete line of new miniature electron tubes by the laboratory and engineering departments of the Radio Corporation of America may make possible the design of smaller radio receivers and compact radio-television-record player combinations. The tubes, a wartime accomplishment in which the best features of two types have been combined, were revealed by R. L. Kelly and N. H. Green of RCA Victor Division before a recent winter meeting of the Institute of Radio Engineers.

Typical savings of 20 to 40 percent in equipment size are expected to result from the reduced size of the miniature tubes, some as small as the little finger. Only the further development of power output amplifier tubes and rectifier tubes in miniature envelopes, a project already showing promising progress, remains to complete the types needed for the full tube complement of home receivers.

Today according to the joint authors, these tubes are helping maintain instantaneous communications in a swift-moving global war; tomorrow they will help provide improved television, FM radio, facsimile, personal radio and other communications equipment.

The cathode-type miniature tube, now playing an essential role in military and naval communications, came into being shortly before our entry into the war. It originated as an outgrowth of separate lines of peacetime scientific research and commercial development in RCA's laboratories and factories.

### *Two Features Combined*

The "wedding" of the acorn type tube, developed by RCA as part of a program of research in the ultra-high frequency field, and the filament-type miniature tube, developed and introduced by RCA in 1938, as the heart of the RCA personal radio receiver, produced the first cathode type miniatures in 1940. By merging special features of the two earlier types, the efficient high frequency performance of the acorn was combined with the smaller size and lower cost of the miniature.

Since small size and efficiency at high frequencies are both important requisites of military and naval equipment, a vital need for large quantities and numerous variations of this type of tube arose with our entry into the war.

"At the rapid pace at which our armies and navies move in this war," Mr. Kelly pointed out in the paper, "most of their communication equipment must be transportable, if not actually installed, in vehicles, planes, or ships, and must, therefore, be small and lightweight. For this reason, the 1.4-volt filament-type miniature tubes, introduced by RCA in 1938, were adopted early in the war for use in the so-called 'Walkie-Talkie' equipment.

"Meantime, the development of ultra high frequency equipment had revealed that both metal and glass types of standard broadcast receiving tubes had definite frequency limitations. The filament type miniature tubes offered appreciable advantages in reducing the size and weight of equipment, but their electrical characteristics were not well suited for operation at the higher frequencies.

"Equipment designers therefore turned to the well-known acorn types, but while these tubes gave excellent performance at high frequencies, the chassis area required for their ring-type sockets presented a serious limitation to reductions in the size of equipment."

### *Less Chassis Space Needed*

Recognition of these problems led to the development of an entirely new line of RCA tubes in which the cathode-type inner structure of the acorn, designed for high frequency operation, was combined with the small envelope and base which had been used for the filament-type miniature. This type of base, having vertical contact pins instead of the radial pin arrangement characteristic of the acorn tube, requires considerably less chassis area than the latter.



LEFT: MANY MINIATURE TUBES ARE NEEDED TO MAKE A HANDFUL. BELOW: A CHECKER INSPECTS SCORES OF SMALL TUBES BEFORE THEY ARE SHIPPED.



# NETWORK POLICIES REVISED

*Changes Necessary, Niles Trammell, President of NBC, Announces, If Program Quality Is to be Maintained.*

CERTAIN network policies on commercial programming have been revised to improve service in the public's interest, Niles Trammell, president of the National Broadcasting Company, has announced in a letter and brochure sent to advertisers, advertising agencies and affiliated stations.

Revisions comprise discontinuance of the Abeyance List; full approval by the network of replacement programs; elimination of control of time periods by artists and a ban on references to programs on other networks.

In discussing the discontinuance of the Abeyance List on August 30, 1943, Mr. Trammell pointed out that thereafter, whenever a period of time became open, the program chosen for that period was selected on the basis not of its seniority on a waiting list but of program quality, and with reference to the requirements of a balanced network program structure. As a direct result, he said, "we have been able to schedule several outstanding programs which are now contributing greatly to the over-all listening of the NBC network."

### *Obligation to Listeners*

Covering the announcement on "Replacement of Programs," Mr. Trammell said, "In line with the same philosophy, we believe that whenever an advertiser discontinues a certain program but wishes to retain the same period of time, we have an obligation to our listeners, our other sponsors and our stations to make certain that the replacing programs shall be as interesting and entertaining as the one discontinued, or more so."

In explaining the network's decision dealing with the control of broadcast time by talent, Mr. Trammell stated that with a single exception, such control or assignment has never been authorized by NBC.

"The exception occurred a number of years ago when, with the full consent of his sponsor, the period occupied by an artist was assigned to him, completely subject of course to the approval by NBC of his future sponsorship and programs. The circumstances which warranted this arrangement at that time were unprecedented and their recurrence is altogether improbable. In the future, no such control will be sanctioned."

### *Provides Maximum Audience*

The decision to eliminate "Cross References to Programs on Other Networks," with the exception of certain guest artists being identified with their own programs on other than NBC broadcasts, was taken, Mr. Trammell explained, to provide all advertisers with the maximum NBC audience and to treat all alike.

He pointed out that "some ten years ago one of our customers bought time on another network and then requested the privilege of calling attention to his other program by means of announcement on his NBC show. On a more or less experimental basis we agreed to a somewhat indirect type of announcement, which called attention to the other program and directed the listener to consult his local newspaper for time and station. This type of announcement has been used in similar cases ever since.

"We have now reached the conclusion that this practice is inconsistent with our efforts to provide all advertisers with the maximum NBC audience, and to treat all alike, regardless of the number of programs they may have on the air. In this connection we are not referring to guest artists who may be identified on an NBC program by reference to the sponsor of their regular program that is scheduled on another network."

In a more detailed account of NBC's procedure covering "Replacement Programs and Their Acceptability," Mr. Trammell said, "We will not enter into any more so-called automatic renewal facilities contracts, and have terminated all existing agreements of that particular type."

By discontinuing the automatic renewal feature, he pointed out, "every NBC contract will again be on the original basis of 52 weeks (or less), with 13-week cancellation privileges to the advertiser.

"By fulfilling the public demand for creative entertainment of the highest quality, each program will do its share to maintain and increase the overall listening to the network and enhance the network's value to all listeners and consequently to all advertisers."

Concluding the announcement, Mr. Trammell said, "We feel sure that all NBC clients will recognize in the principles outlined and procedure announced herein a reasonable effort on our part to fulfill our obligations to the public, and to our many customers who serve the public well by maintaining the highest possible level of program quality."

### *Middle Commercials Eliminated*

In another order issued by Mr. Trammell on March 15, all commercial announcements in the middle of newscasts, originated by NBC and its owned and operated stations, were eliminated effective immediately. The action was taken, the announcement said, "because news today is our Number One public service obligation and commands the eager interest of all ages and classes." It was pointed out that the move is in line with a policy already in force under which NBC sponsors cooperate in eliminating middle commercials, or upon occasion, commercials of any kind, from news broadcasts during events of supreme interest.

Under the new ruling, sponsors of news programs have been requested to include their commercial announcements within the first two minutes and the last three minutes of all fifteen minute news periods.

Mr. Trammell paid tribute to network advertisers whose support has made a constantly greater volume of worldwide news coverage possible and expressed his belief that the new step would receive the same wholehearted cooperation.



DR. C. B. JOLLIFFE



OTTO S. SCHAIRER

# Jolliffe Moves Up

*HE IS ELECTED VICE PRESIDENT IN CHARGE OF RCA LABORATORIES—MR. SCHAIRER IS STAFF VICE PRESIDENT*

DR. C. B. JOLLIFFE, Chief Engineer of the RCA Victor Division, has been elected Vice President of Radio Corporation of America in Charge of RCA Laboratories, Brigadier General David Sarnoff, President, announced following the March 2 meeting of the Board of Directors. Dr. Jolliffe succeeds Otto S. Schairer, who was elected Staff Vice President of RCA at the Board meeting. Mr. Schairer will be consultant and advisor on matters pertaining to research, development, patents, trademarks and licenses.

The Board also authorized Ewen C. Anderson, Commercial Manager of RCA Laboratories, to execute license agreements under domestic patent rights and to coordinate the commercial activities of RCA Laboratories with those of the RCA Victor Division.

A native of Morgantown, West Virginia, Dr. Jolliffe was graduated from West Virginia University with a B.Sc. degree in 1915 and received the M.S. degree in 1920. He was awarded the Ph.D. in 1922 at Cornell University, where he was instructor in physics from 1920 to 1922. His Alma Mater conferred the honorary degree of LL.D. in 1942.

From 1922 to 1930, Dr. Jolliffe served as physicist in the radio section of the Bureau of Standards, resigning to become chief engineer of the Federal Radio Commission. He remained for five years with the FRC and its successor, the Federal Communications Commission, and then joined the Radio Corporation of America as engineer-in-charge of the RCA Frequency Bureau. In 1941, he was appointed chief engineer of RCA Laboratories, and early in 1942 he was made Assistant to the President of RCA. In September, 1942, he was appointed chief engineer of the RCA Victor Division, Camden, N. J.

While with the Bureau of Standards, the FRC, the FCC and later with RCA, Dr. Jolliffe attended most of the international radio conferences as technical advisor or delegate. During the war he has been active on several Government wartime committees including Division 13 of the National Defense Research Committee of the Office of Scientific Research and Development, which he served as chairman from 1940-1944; as secretary of the Industry Advisory Commitee of the Board of War Communications and as a member of the Engineers Defense Board. He is a member of Phi Beta Kappa and Sigma Xi. His home is at Princeton, N. J.

Mr. Schairer joined RCA in 1929 as Director of Patent Development following 27 years with the Westinghouse Electric and Manufacturing Company, which he entered in 1902 after graduation from the University of Michigan with an E.E. degree.

Soon after affiliation with RCA, Mr. Schairer was placed in charge of the combined patent and license departments. In 1930, he was elected a Vice President of the Company.

Plans for a great research center in radio and electronics, which he had fostered for many years, materialized in 1941, when the Radio Corporation of America built RCA Laboratories at Princeton, N. J. Mr. Schairer, as Vice President in Charge of RCA Laboratories, supervised the plans and construction, and since the dedication in September, 1942, has directed extensive research and developments concerned almost exclusively with war projects.

## Beal Elected Vice President of RCA Communications



Ralph R. Beal, Assistant to the Vice President in Charge of RCA Laboratories and for nine years Research Director of the Radio Corporation of America, was elected Vice President of RCA Communications, Inc., in Charge of Engineering, Brigadier General David Sarnoff, President of RCA, announced following a meeting of the Board of Directors on April 6.

Mr. Beal joined the Radio Corporation of America in 1926 as its Pacific Division Engineer, and in 1934, he was transferred to New York as Research Supervisor of RCA. Three years later, he was made Research Director.

Mr. Beal is a Member of the Institute of Radio Engineers and a Fellow of the Society of Motion Picture Engineers. For the past two years, he has been a member of the Microwave Committee of the National Development Research Committee of the Office of Scientific Research and Development.

# Opera by Television

*BY COMBINING SIGHT AND SOUND, NBC HAS PROVED THAT THE AGE-OLD CLASSICS CAN BE FURTHER POPULARIZED*



By Dr. Herbert Graf
*Director of Operatic Production, National Broadcasting Company*

TELEVISION has taken the first definite step to lift opera out of the "old fashioned" phase into the form that makes it acceptable to Broadway standards. This pioneering move, made by NBC through its television station WNBT, will, I feel certain, have the same popularizing effect upon opera that standard radio has exerted upon concerts. Thousands of people, to whom the best music was something intended only for a select group of erudite music lovers, are now regular listeners to symphonies and recitals. By combining sight with sound, television makes the picture of an opera performance complete.

After many weeks of experiments and trial rehearsals, NBC, late in 1944, produced several scenes from "La Boheme." Success of this attempt was followed in turn by a dramatized aria from "Barber of Seville"; a condensed version of an entire grand opera, "Carmen," with a cast selected mostly from members of the Metropolitan Opera Company, and a condensed version of an entire light opera, Johann Strauss' "The Bat." Later, we produced Stephen Foster's "Swanee River."

The writer adapted these productions into English, using spoken dialogue where desirable and employing stage sets designed to television studio requirements.

These experiments proved that opera can be a "natural" and that television forces it to become so. For one thing, we learned that the new medium requires methods of production different from those usually applied in legitimate operatic presentations.

### *Good Looks Essential*

Television, we discovered in our early rehearsals, calls for a different type of singer. Good looks is one prime requisite for the new medium; a relaxed facial expression while singing is another. It is not a simple matter to find vocalists who have this combination of good voices, good looks, and good acting abilities and who also have the inherent ability to memorize new versions and the willingness to work long rehearsal hours for comparatively modest remuneration.

From these pioneering experiments we have learned much about the methods of television opera production. For the finest development of the art we must have fewer productions, and better quality of voice, diction and gesture and an attractive appearance.

Television, in my opinion, settles by itself the long debated question about the language of opera. For television, being a technique which stylistically lies midway between opera comique and film, is a natural technique favoring realism more than the usual grand opera production. Television, too, gives preference to dialogue over the recitative and to the use of the native language of the audience rather than to the language in which the original was written. Grandiloquent gestures which have been considered natural to opera also must be replaced in television versions by realistic action.

### *All Details Must Be Planned*

But this is not all. Television will reach its ultimate audience acceptance only when it is able to present a well-rehearsed ensemble with exact planning of all details including the placing of every detail of action for the establishment of camera shots. In television, unlike the making of films, a "shot" cannot be greatly changed once the performance is under way. This situation practically excludes last minute improvisations by the stars, however brilliant these same improvisa-

STUDIO SETTINGS RECREATE THE ATMOSPHERE OF PUCCINI'S "LA BOHEME" IN THIS SCENE FROM A RECENT TELEVISION PRODUCTION.



tions might be on the operatic stage. Thus the opera artist desirous of working in television must be willing to subordinate himself to the ensemble idea.

In our work so far in adapting operas to television, we have been reminded frequently that we must use extreme care in modernizing old operas lest we ruin them. There is more than a substance of truth in this warning. If we are to succeed we shall need people who know operatic technique of the past and yet have the courage to go ahead on the new basis.

Television opera creates a wide new field for producers, writers, composers and artists. The medium offers a real and promising opportunity to the wealth of vocal talent now available in this country.

I am convinced that television will not, as some believe, bring harm to the traditional form of opera. Rather, it will do as radio already has done: it will enhance opera by further extending the public interest in its exploitation.

In short, television will be the democratizing force which will force opera to take off its top hat and speak the language of the people. In so doing it will help decisively to make opera a popular art in America for Americans.




THE TELEVISION CAMERA TAKES A "CLOSE-UP" OF A VOCALIST IN AN EXCERPT FROM "THE BARBER OF SEVILLE."

## FRENCHMAN PRAISES AMERICAN RADIO SET

*News Picked Up by 1934 Model Receiver, Bolstered Family's Morale, Correspondent Writes*

AN American made radio set, built in 1934 but still giving yeoman service 11 years later, was the means by which a French family in enemy-held territory retained faith in ultimate freedom through dependable news of the outside world supplied by U. S. short wave stations. In a letter written recently from Paris, Maurice Gilon, owner of the receiver, an RCA model 141, expressed his gratitude for the French language broadcasts "which helped us in great measure to endure four years of German occupation and oppression."

Addressing his letter to "Dear Friends of NBC", M. Gilon wrote:

"What a joy it is to be able at last to write you freely and express all our gratitude to you for your broadcasts in French, which helped us in great measure to endure four years of German occupation and oppression.

"As to myself, I am the father of a family and one of your faithful listeners from a long way back. I have listened to short wave in Morse code since 1923 and tuned in the first American amateur stations. In 1934, I bought an RCA set, model 141. For the last ten years, often under the worst possible conditions, this set has always given me complete satisfaction, in spite of its thousands of hours of operation.

"During the war, 1939-40, and my imprisonment in Germany, 1940-41, my wife and children listened every evening to the voice of America.

"When I got home from captivity in August 1941 (released because I was a veteran of the 1914-1918 war), I took up again my regular listening to American and British short wave. The countless broadcasts over the 'W' stations laughed at Boche jamming, and thanks to them we were kept posted, hour by hour, on what was happening. Thanks to them, we were able to hold steadfast in the midst of terror and lies.

"In the name of my sons, my wife and myself, I say again: thank you. I hope a day is coming soon when I shall be able to tell you this same 'thank you' in New York itself, in NBC's magical 'City of the Air Waves'."

## Buy War Bonds

## Prize Winners Announced

THE two prize-winning compositions in the first Western Hemisphere string quartet competition sponsored by the Washington Chamber Music Guild in cooperation with RCA Victor received their world premiere in Constitution Hall, Washington, D. C., on February 27.

Recipients of the $1,000 awards donated by the RCA Victor Division of Radio Corporation of America were Robert Doellner, Hartford, Conn., music teacher, whose composition, "String Quartet No. 1" was adjudged best among North American entries, and Camargo Guarnieri, young Brazilian composer and musician, winning contestant from Latin American countries. The compositions were performed by the Chamber Music String Quartet of Washington.

Because of the contest's international cultural aspects, Latin American diplomats and high ranking government officials attended the concert, which was broadcast to Latin American countries by arrangement with the Coordinator's Office of Inter-American Affairs.

Of the more than 300 string quartet compositions submitted in the competition, many were from men in the armed forces, according to Marcel Ancher, Guild founder.



THE REVEREND ROBERT I. GANNON, PRESIDENT OF FORDHAM UNIVERSITY, PRESENTS THE "ONE WORLD" AWARD TO BRIGADIER GENERAL DAVID SARNOFF AT THE AMERICAN NOBEL CENTER'S FIRST ANNUAL "ONE WORLD" DINNER IN MEMORY OF WENDELL WILLKIE.

# "One World" Honor

## *GENERAL SARNOFF RECEIVES AWARD FOR HIS ACHIEVEMENTS AS "MOULDER OF WORLD OPINION THROUGH RADIO"*

THE "One World" medal, established in honor of the late Wendell Willkie was awarded to Brigadier General David Sarnoff, at the first annual dinner of the American Nobel Center, February 18, at the Hotel Astor. In presenting the award, the Reverend Father Robert I. Gannon, S.J., president of Fordham University, who presided as toastmaster, said that General Sarnoff had been chosen for the honor because of his work as "a moulder of world opinion through the radio and as the promoter of popular culture that knows no State or national boundaries."

Responding to the presentation, General Sarnoff, spoke on "Science and Peace" and discussed "the role of radio in the achievement of peace in One World."

"Throughout the ages," he said, "history has written in letters of blood, that the ultimate principle of man's moral code must be an enlightened altruism. If he is to remain a civilized creature his goal must be the common good.

"The great problems which lie before us must be solved and the results coordinated if we are to have peace and security. Education is one vital factor in that solution. Communication is another. With a free press, and a free radio the methods of communication which science is constantly enlarging will enable us to enlighten a waiting world.

"I believe that through the amazing progress in electronics the peoples of the World will know each other better. Today American radio, because of the constant messages of courage and good-will, truth and sincerity, which it has broadcast in the name of Liberty to oppressed populations, is acclaimed overseas as 'the Voice of Freedom.' It can also be 'the Voice of Peace.'

"For radio belongs to the people of all Nations. By its very nature it is the essence of Freedom. It bestrides the continents and leaps across frontiers to reach all men, rich and poor alike. The size of the earth has been shriveled and distances annihilated, making this planet a mere community, and all people neighbors in One World. Europe's relation to America is no longer the 'detached and distant situation' that George Washington noted in his Farewell Address. There is no national exclusiveness in radio; no trace of narrow isolation in waves that carry friendly voices to every Nation and into many millions of homes at the speed of light.

"Science can give to the essential Freedoms the wings needed to reach people everywhere—simultaneously! Therein lies radio's great role in the establishment and perpetuation of Peace.

"Today, radio and the press are inseparable in the defense of freedom of speech and expression. Liberty is the watchword. To this end America must have more powerful facilities and more effective international programs to serve a world at peace. We must have sufficient world-wide radio circuits to carry news and pictures freely and directly to and from all corners of the earth.

"Radio has given freedom of expression a new dimension. Consider how President Roosevelt and Prime Minister Churchill have inspired untold millions by their voices in

space! From them the world has caught new hope for freedom. In radio, freedom of worship finds a true voice for all creeds. Again the electrified word extends the influence of the pulpit and the printed word by carrying the gospel to all people.

"To the Four Freedoms, I would add a Fifth—Freedom of Science. It is essential to the maintenance of world unity. Political and social limitations and expediencies must not fetter the application of scientific knowledge, nor stop the quest for it. Man must be free to think; free to conduct research, free to develop his ideas, free to invent and to produce.

### *Influence for Good*

"The impact of enlightened public opinion upon individual thought can be a vast influence for good. It can stimulate ideas. It can strengthen belief. It can bring hope. It can inspire courage.

"But false propaganda, as we have seen in the Axis nations, can degrade public opinion, brutalize millions of people, and touch off a wave of fanaticism that leaves half the world a barren desert. We need more than merely the better means of world communications which science has given us. We need more than the easy ability to communicate with each other in this One World we all envisage. We need most to keep the channels of that communication *free* so that man's noblest thoughts, untrammeled by censorship, may best serve mankind.

"In the cooperative relationship of radio, press and motion pictures, we find an excellent example of how each contributes to the other, and the total effort becomes one of progress in greater service to the public. The press associations supply news to the broadcasters just as broadcasters often give historic news to the press. On the newsreels in theatres, the public sees the events brought to life which they have read in the press or heard over the radio.

"Scientific wartime developments promise a rapid postwar expansion of television, wherever Governments encourage its use. As one of the foremost steps toward international solidarity we should study the promising uses of television in helping preserve the peace.

### *World-Wide Television*

"Let there be no doubt that the world eventually will have international television. It will be a new educational force with a double appeal to eye and ear, put at man's disposal by science, to give him a new and more intimate understanding of his neighbors. Pictures are an international language. They convey clearer and quicker impressions than words spoken in a foreign tongue, or written in a foreign language. Nations will then see themselves as others see them, for the world is destined to go sightseeing by radio. People everywhere will understand, as never before, how freedom functions in Democracies.

"Not only a greater hope for lasting peace, but a greater opportunity for economic freedom—freedom from want—is embodied in science. On every hand we see evidences of man's ingenuity to create new products to fulfill his basic needs by mastery of Nature through science. At the moment he is looking upward to the air which already offers him new and speedier means of communication and transportation.

### *Universe Unexplored*

"The vast universe is still unexplored. To advance civilization we must continue to go up—and so we will—as man becomes the master of Nature.

"When Victory comes, the men who have been applying science in the laboratories for war on the battlefronts, will direct their talents and skills to science for peace. These scientists will go onward in their conquest of space. Through their genius, I believe, science will provide in ever-increasing abundance, the necessities, the comforts, the luxuries of life and will enable civilization to triumph over hardship, famine and disease."

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## Radio Engineers Honor Dr. Beverage



DR. H. H. BEVERAGE, (RIGHT), ASSOCIATE RESEARCH DIRECTOR OF THE RCA LABORATORIES, RECEIVES FROM DR. W. L. EVERITT, PRESIDENT OF THE INSTITUTE OF RADIO ENGINEERS, THE IRE MEDAL OF HONOR "IN RECOGNITION OF HIS ACHIEVEMENTS IN RADIO RESEARCH AND INVENTION, OF HIS PRACTICAL APPLICATIONS OF ENGINEERING DEVELOPMENTS THAT GREATLY EXTENDED AND INCREASED THE EFFICIENCY OF DOMESTIC AND WORLD-WIDE RADIO COMMUNICATIONS, AND OF HIS DEVOTION TO THE AFFAIRS OF THE INSTITUTE OF RADIO ENGINEERS." THE PRESENTATION WAS MADE DURING THE INSTITUTE'S 1945 WINTER TECHNICAL MEETING.

# COVERING THE WAR FRONTS

*Back from a Survey of Battle Areas, NBC News Head Praises Radio, Press and Communications Personnel Working with Troops*



By William F. Brooks

*Director, News and Special Events, National Broadcasting Co.*

AT NO TIME in history have the American people been so well informed about what is going on in a war time world as they are at present. Radio, press and communications people have combined in a super team to bring news and background material to the home front almost as the action itself is taking place.

In the past three months I have traveled to fleet headquarters in the Pacific and to General Dwight Eisenhower's supreme headquarters in Europe. I have ridden behind the western front in France from the Vosges Mountains in the South to central Belgium, making a survey of NBC staff and facilities, and it is impossible to escape this conclusion. This is a radio war. Not a plane flies, or tank moves, or ground force begins an assault without the link of radio communications with headquarters. The U. S. Army Signal Corps has worked closely with broadcasters and newsmen everywhere in order that on-the-spot reporting may inform American listeners and readers.

When I left Europe five years ago after nine months of war I did not believe technical facilities would ever be permitted or developed to provide the wide scope of coverage which now prevails. As Managing Director of the Associated Press of Great Britain, Ltd. and The Associated Press, GmbH, Germany, I had watched the preparations of the various foreign powers for all-out war. Neither the British nor the French had the conception of the power of news and communications that then existed in Germany.

The German propaganda bureau was holding daily meetings with German radio, newsmen, and photographers. Their needs were embodied in battle plans by the German general staff and when the Boche swept into Western Europe on their initial thrust facilities for on-the-spot coverage went along with the spear-head forces. At Dunkirk airplanes equipped with photographic darkrooms shuttled photographs back to Berlin on an every hour schedule so that they could be radioed to the United States and other countries.

### *Provided Own Facilities*

After the entry of the United States into the war it appeared for a time that we would follow in the footsteps of the British and the French insofar as providing news facilities was concerned. But this attitude, fortunately, was changed.

The most signal change came with the invasion of France last year. Plans developed in preparation for this event made it possible for radio and newspapers to give it the greatest coverage in the history of the world.

Several months before the invasion a special Signal Corps public relations mission arrived in England. This mission was headed by Brigadier General David Sarnoff, then on leave as president of the Radio Corporation of America. The mission plunged into the situation and set a pattern for facilities which was so successful that it has been carried into succeeding operations and into other theaters.

At one time we radio broadcasters were crying our eyes out for transmitters at various points. Now the situation is reversed in a way. Only recently one army group headquarters messaged the war department that it now had a beautiful transmitter but no radio reporters to go with it. NBC answered the call and Edward Haaker was dispatched from his London post to Sixth Army Group headquarters in the south of France to provide on-the-spot coverage over RCA facilities.

The invasion pattern also has been followed in the Pacific. When General MacArthur steamed into Leyte and Luzon and went on to Manila, a portable radio transmitter, installed on shipboard, accompanied the troops. Aboard were George Thomas Folster and Pat Flaherty of NBC. Col. Edward Kirby of the Radio Branch of the Public Relations Section of the War Department says this ship has been described as the "ship with the singing masts" for it is loaded with radio equipment and a transmitter beamed to San Francisco.

From this ship Folster and Flaherty flashed word of the liberation of Santo Tomas, the fall of Manila, and the recapture of Corregidor.

Similarly, when U. S. troops went into Iwo Jima, Wilson K. Foster of NBC and other radio news men were permitted to broadcast from a battleship just a mile or so off shore.

### *Conferred With Staff*

I flew from New York to Paris. After conferences with NBC personnel and communications officers in SHAEF I rode down the Meuse valley to a point behind the Colmar pocket, which General Devers' troops had just cleaned up. It is with this Army Group that Army Signal Corps and RCA technicians under the supervision of Thomas D. Meola, have set up a complete commercial short wave radio station over which U. S. broadcasters and newsmen transmit.

I went up the Moselle, through Nancy, Metz and Thionville, to Luxemburg. Then I drove north to Central Belgium for a conference with General Omar Bradley of the Twelfth Army Group and back for a talk with General George S. Patton, colorful commander of the U.

S. Third Army. All of these officers and their staffs seemed fully conscious of the morale value of getting news back home, and particularly radio's part in the job.

### *A Talk With Patton*

General Patton said he thought the Signal Corps and the truck drivers deserved special mention for their less spectacular, but just as important, work. To illustrate, he said he was driving around the front on what is known as Skyline Drive. This is a road along a bluff immediately across the river from German positions. It was under more or less constant shelling from enemy guns. Army drivers customarily speed as fast as possible along this stretch. The General's driver was no exception. Suddenly they went around a curve and there were two Signal Corps trucks parked in full view of the Boche. Two linesmen were unconcernedly perched on top of poles repairing a broken line. The General stopped and called out to the men.

"Don't you fellows know this road is under fire," he asked.

"Sure," said one of the linesmen, "but this blankety blank wire has to get fixed."

The General said this was typical of the spirit of the troops in keeping communications at top efficiency.

I can testify to the difficulty of working under even less dangerous conditions. I was interviewed by NBC's David Anderson in a broadcast over the Army transmitter at Luxemburg. We had written our script and at the last minute one paragraph was eliminated. Anderson, and Lt. Col. Howard Nussbaum, formerly of NBC and radio officer for the Twelfth Army Group, who made the trip with me, both cautioned that I should maintain a slow pace in order to fill the time.

We had been on the air about three minutes when a bomb dropped down the street. When I looked up next, everybody in the studio was signaling me to slow down. I had accelerated my speech so that we were headed for a quick ending. This happened three times during the broadcast with the result that we had to "return to the NBC newsroom in the United States" about a minute and a half too soon. We were unable to ad lib anything because of censorship but fortunately the newsroom staff in New York quickly stepped into the emergency and filled the extra time with news bulletins.

### *Planning in Paris*

Back in Paris, Stanley Richardson, NBC London manager; Paul Archinard, NBC Berne representative, and other staff members held conferences outlining plans for broadcasting coverage from Berlin after its capture.

A 60,000 watt transmitter, mounted in sections on 17 Army trucks, is prepared to travel with American troops driving into the German capital and it is expected that first on-the-spot broadcasts from there will be transmitted over this facility.

Other facilities and plans were discussed and put into operation for broadcasting V-E Day, if the war ends at any set time, and for post-war broadcasting from European points.

To strengthen our war end coverage various shifts in NBC personnel were arranged:

Paul Archinard was transferred from Berne, Switzerland, to be Office Manager of NBC's Paris headquarters in the Scribe Hotel. Tom Hawkins, A. P. war correspondent with wide experience in the European theater, replaced Archinard in Switzerland. Roy Porter, former NBC reporter in Chungking, has been sent to Paris and W. W. Chaplin, widely known NBC commentator in New York, is enroute to the western front. John MacVane, David Anderson, and Edward Haaker are assigned to various armies and Max Jordan, who had years of experience in Europe before the war, is on a roving assignment. Bjorn Bjornson has left Stockholm for the western front and has been succeeded by Sven Norberg.

### *Newsmen Face Greatest Task*

With these men, and others to be assigned later, NBC hopes to interpret the momentous events which will follow the war in Europe. Contrary to the opinions of some people, I believe that post-war events will be more newsworthy, in many respects, than the actual war coverage. The peak of European confusion is yet to come.

When military censorship is lifted and news from vast countries again is available, American newsmen will face their greatest task.

Radio newsmen should dedicate themselves to the cause of freedom of access to news everywhere. There should never again be permitted a situation whereby selfish rulers can blackout whole countries in news as was done in Germany, Italy, Japan and, to a lesser extent, in France and Spain. Radio can play an ever increasing part in bringing understanding and friendship between nations.

WILLIAM F. BROOKS DISCUSSES RADIO AND PRESS COVERAGE OF THE WAR WITH LIEUT. GEN. JACOB L. DEVERS, SOMEWHERE IN EUROPE.



# New Advances in Radio Foreseen

DR. C. B. JOLLIFFE SEES GREAT POSSIBILITIES FOR RADIO RELAY STATIONS—TELEVISION IS ENVISAGED AS FIVE TO TEN BILLION DOLLAR ENTERPRISE IN THIS COUNTRY

REMINISCENT of conditions which existed at the end of World War I when sound broadcasting came into being as a revolutionary medium of progress, a new radio frequency spectrum opened by scientific developments in this war promises even greater advances, embodying the formation of vast new industries and services for the American people, Dr. C. B. Jolliffe, Vice President in Charge of RCA Laboratories, declared in an address before a joint meeting of the American Institute of Electrical Engineers and the Institute of Radio Engineers at Indianapolis, on March 23.

### *Awaits Public Demand*

"At the end of this world war we will have all of the conditions necessary for an explosive mixture," Dr. Jolliffe said. "If the spark of public demand for new things is struck, we will be in on a much larger explosion than that which occurred with the start of sound broadcasting."

Asserting that the impending allocation by the Federal Communications Commission of all frequencies from 10 kilocycles to 30,000 megacycles will be "one of the important milestones in radio history," Dr. Jolliffe said it will determine the future of many possible uses of radio, including applications of radio frequency power which do not require FCC allocations or authorization.

"Sound broadcasting revolutionized our ideas of entertainment and altered our way of living," Dr. Jolliffe declared. "Television can provide a second revolution of entertainment and affect our mode of living to an even greater degree. The application of electronics can revolutionize manufacturing. In air transportation the use of new developments in radio aids to navigation and communications will change our conception of the reliability of air transportation and make it a really true competitor to surface transportation. 'Citizen's radio' is an entirely new concept of the use of radio communications in everyday life and it may extend enormously the use of radio equipment.

"Each of these applications of radio may create a new industry which may affect other industries. The men who have made radar useful for the complicated business of war certainly can be relied upon to conceive of many uses of the new radio techniques used in this field."

Dr. Jolliffe, declaring that radio manufacturers are now able to build transmitters, receivers and antennas which "will give a very satisfactory television performance for the home," emphasized the necessity of having definite frequency assignments and a well-organized system of distribution of programs.

### *Foresees Huge Industry*

"With frequency allocations definitely set, with program sources organized, and with networks in operation — in other words, with a system organized—this one industry can completely revolutionize our way of life," Dr. Jolliffe said. "It does not take much imagination to see this industry as a possible *five or even ten billion dollar enterprise*, employing thousands of men, either directly or indirectly."

Expressing a desire to avoid controversy as to the merits of whether television should be below 300 megacycles or above 500 megacycles, Dr. Jolliffe remarked that the question which needs to be answered is "whether we want television or not." He said that if the public wants it, technically it can be produced below 300 megacycles. He added that, on the other hand, if the belief prevails that the public does not want television "then let us honestly postpone its inauguration and not hide behind the probability of possible new developments."

Extensive field tests in several large metropolitan areas have established the fact that "very satisfactory entertainment" can be provided by television broadcasting service using six megacycle channels and carrier frequencies below 300 megacycles.

"Having obtained a television system with this degree of performance," Dr. Jolliffe continued, "the television engineer is faced with the problem of determining the extent to which television images must be improved before the public will be conscious of the improvement and be willing to pay a higher price for television receivers.

"What is the nature of the improvement which will be most acceptable to the television audience?" Dr. Jolliffe asked. "Should some new broadcast service be added, for example, the transmission of odors, good and bad? All of these additions may be desired by the public, but each improvement represents an increase in the cost of the receiving instrument and also requires an additional cost in terms of valuable space in the frequency spectrum."

### *Engineers Must Not Be Satisfied*

Dr. Jolliffe emphasized that as the television industry develops, engineers have the obligation to see that the public gets better and better service and that the new developments which would be brought about by the stimulation of use are integrated into an over-all system.

"Engineers should not be satisfied that their television job is done," Dr. Jolliffe asserted, "until they have made it possible to project in the home pictures of adequate size in color, and also for anyone to attend — by television — all major happenings wherever they occur, in the United States or in

any other part of the world. These objectives may be accomplished in a few years, or many years may be required."

Another important field of radio development is in aviation, Dr. Jolliffe pointed out, stressing the necessity of continuing advances in this work after the war to insure the safety and expansion of the great air transportation for public and private use. He added:

"Radar has been publicized chiefly for its use as an instrument for increasing the destructive power of aircraft. It can be and is used, however, to guide and land planes under the poorest visibility conditions. Radio instruments can look ahead and warn the pilot of obstacles in the path of the plane and tell the pilot at all times the height of the plane above the ground. Vacuum tubes (electronics) can make the operation of flight instruments more accurate and dependable. Radio communications, of course, can keep the pilot and passengers in touch with persons on the ground and in other planes. Radio then can make flying a safe and reliable service; therefore, it can be an important part of another big industry."

### *Outlook for "Citizen's Radio"*

Dr. Jolliffe in his address foresaw the day when "citizens' radio" —personal radio communication— will have a prominent role in our lives. He recalled how the walkie-talkies and other portable radio apparatus have demonstrated their usefulness in the war, and reminded his listeners that the FCC has already planned frequencies for their peacetime counterparts.

"Regulations for this service," he said, "will be so simple that anyone can use the apparatus without restriction; only simple licenses will be required. A farmer's wife can talk to her husband while he is riding his tractor; a construction superintendent on a skyscraper can give direction to his workers; a doctor can keep in touch with his office. These are examples—the possible uses are as extensive as the human mind can imagine."

### *New Uses for Portable Equipment*

Use of portable radio equipment in police work, forest protection and in new public service communications, Dr. Jolliffe stated, are all due for rapid expansion. But he added that two new applications of radio deserve special mention.

"We are accustomed to think of telephone and telegraph traffic being carried by wires," Dr. Jolliffe said. "Recent developments in ultra-high frequency radio have shown that radio relays can also do the job. Directive beams in the ether can carry messages as well as wires. Using frequencies of 1,000 megacycles or more, it is possible to use the technique of wire communications without many of its limitations.

"It is not fantastic to imagine long telephone and telegraph lines being replaced by lines of towers spaced 25 to 40 miles apart with small automatic radio transmitters and receivers carrying many messages simultaneously through the ether from coast to coast. A single communications channel may carry telegraph, telephone and television messages or programs simultaneously with less maintenance or service than simple wire lines."

The second application, which Dr. Jolliffe said promises "great impact on industry," is the use of radio frequencies for heating. He reported that the development of radio heating has gone forward rapidly in recent years and is being used to speed and improve the efficiency of many industrial processes.

In conclusion, Dr. Jolliffe said: "I want to emphasize again that we, as engineers, have a responsibility not only for the creation of the apparatus that is useful in new industries but also for the organization of this apparatus into systems and services that can be the basis for new industries and new employment. Also, we must continue to recognize our responsibility to the Government in peace as well as in war, and do our part to provide adequate technical preparedness as a practical measure to insure the permanence of peace."

## RCA FORMS DIVISION FOR FOREIGN SALES

*John G. MacKenty Appointed to Head International Group Which Will Supervise Company's Activities Abroad*

A NEW RCA International Division has been formed by the Radio Corporation of America to supervise foreign sales and other activities of the Company and its subsidiaries outside of the United States, Brigadier General David Sarnoff, President of RCA, has announced. Headquarters of the Division will be in New York.

John G. MacKenty, Vice President and General Manager of Radiomarine Corporation of America, has been appointed Managing Director of the RCA International Division. Mr. MacKenty has been associated with the Company for more than twenty-three years and has held important posts at home and abroad.

The International Division will have charge of the export of all products manufactured and sold by RCA companies and divisions, and will supervise RCA interests abroad.





ARCHIBALD MAC LEISH AND DEAN ACHESON, ASSISTANT SECRETARIES OF STATE, OPEN NBC'S SERIES OF PEACE PLAN DISCUSSIONS.

# "Our Foreign Policy"

### *THE STATE DEPARTMENT AND CONGRESSIONAL GROUPS JOIN WITH NBC TO PRESENT SERIES OF PEACE PLAN DISCUSSIONS*

FOR the first time in the 25 years of radio's history, the Department of State, the Senate Foreign Relations Committee and the House Committee on Foreign Affairs, the three major governmental bodies charged with the formulation and execution of America's international policy, are participating in a joint broadcast discussion of plans for building the peace. The exclusive series, part of the NBC University of the Air, started February 24 and is heard each Saturday at 7.00 p.m., EWT., under the title, "Our Foreign Policy."

Secretary Edward R. Stettinius, Jr., was expected to launch the opening program but attempts to pick up his broadcast from Mexico City, where he was attending an Inter-American conference, failed. In his absence, his address was read by Assistant Secretary Archibald MacLeish, who acted as chairman throughout the seven programs which represented the State Department's portion of the series.

Following the conclusion of the State Department participation, twelve or more additional programs devoted to American international policy are to be conducted by the legislative branch. Among the members of the Senate and House Committees who are scheduled to appear are Chairman Tom Connally and ranking minority member Hiram W. Johnson of the Senate Committee, Chairman Sol Bloom and ranking minority member Charles A. Eton of the House group. Legislators who are not members of the two committees but who represent various shades of opinion will be heard in later programs.

Titles of individual programs and the speakers who participated indicate the wide scope of the series:

"Main St. and Dumbarton Oaks."

Under-Secretary of State Joseph C. Grew; Alger Hiss, Secretary of Dumbarton Oaks Conference.

"World Trade and World Peace."

Assistant Secretary of State William Clayton; Assistant Secretary of State Dean Acheson.

"What About Liberated Areas?"

Assistant Secretary of State James C. Dunn; Charles Taft, special assistant to Clayton.

"What About Enemy Countries?"

Under Secretary of State Joseph C. Grew.

"America's Good Neighbors."

Assistant Secretary of State Nelson Rockefeller, Ambassador to Brazil Adolph A. Berle; Ambassador Spruille Braden.

"It's Your State Department."

Secretary of State Brigadier General Julius Holmes; Michael McDermott.

Following the Roosevelt-Churchill-Stalin meeting at Yalta and the announcement that the next United Nations Conference would be held in San Francisco, directors of "Our Foreign Policy" decided to make the west coast city the originating point of the broadcasts for the duration of the Conference.

The NBC University of the Air has announced that a book containing texts of the broadcasts by the State Department and the two Congressional Committees will be available in the summer. Plans have been made to make this volume a permanent reference work on international relationships and peace.

"Our Foreign Policy" has been endorsed by four of the major Protestant denominations, and 47,000 ministers of the Presbyterian, Congregational, Baptist and Methodist churches have been urged to listen to the broadcasts.

## 4th Star for Radiomarine

A fourth star for the company's Army-Navy "E" Flag in recognition of continued excellence in production has been awarded the Radiomarine Corporation of America. In notifying Charles J. Pannill, President of Radiomarine, of the award, Admiral C. C. Bloch, USN (Ret.), Chairman of the Navy Board for Production Awards, congratulated Radiomarine employees for their "splendid production record" and stressed the urgency for continued support of all war workers to back up America's fighting forces.

Admiral Bloch also wrote that "in view of your excellent record, the Army and Navy have decided that your company may retain the flag for a year before being considered for the next renewal." It has been customary for continuation of the award to be decided on the basis of production over a six-months period.

# RELAYING BY RADIO

*Towers Spaced Across the Nation Will Act as Repeater Stations to Carry Television and Other Services—First Tests Begun in 1923*



By C. W. Hansell

*RCA Laboratories, Rocky Point, L. I.*

SLENDER towers standing like lighthouses on the peaks of high hills and stretching in parade-file over flatlands hold promise today of becoming the means by which television programs will be made available to the entire nation. Using this medium, television signals comprising the sound-and-sight entertainment of the future will be "bounced" by radio from one tower to another, leaping gaps of 20 to 50 miles at each jump. Now that research scientists and engineers have brought television to a point where it is ready to create a new American industry, the planning and erection of these repeater stations is the next logical step.

For the past twenty years, the Radio Corporation of America has conducted experiments in radio relaying. Beginning with a radio carrier frequency of 182 kilocycles, research and development have gradually increased the utilized frequency to 500 megacycles. At the same time modulation bands have increased in width from 2000 cycles to four megacycles.

In 1923, RCA began the development of a radio relay station at Belfast, Maine. Its purpose was to intercept longwave transoceanic telegraph signals at a location where directional reception would reduce interference from lightning storms and to relay intercepted signals on another frequency to the RCA receiving station at Riverhead, Long Island. A year later, a second relay transmitter was completed at Belfast to operate on frequencies around 3 megacycles. This transmitter is believed to be the second one in the world equipped for quartz crystal frequency control, and the first to be put to practical use. By means of this unit the first broadcast programs were brought from London to New York for rebroadcast purposes. For RCA, it marked the beginning of shortwave equipment development and propagation tests which contributed to the present world-wide networks for international radio communication.

### *Four Firms Cooperate*

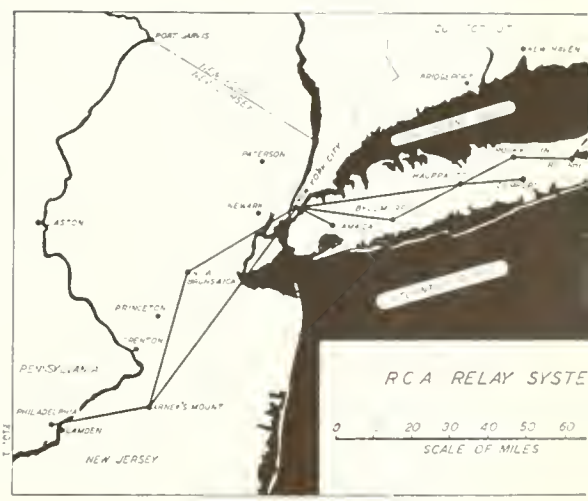
Soon thereafter, an experimental station was installed in the Empire State Building in New York City. It was at this stage of progress that the ultimate necessity for a television network, with which to carry programs from city to city, became apparent. Consequently, RCA and NBC, in cooperation with the General Electric Company and Westinghouse, undertook in 1932 the development of a relay station to carry experimental television from New York to Camden, New Jersey. A site on Arney Mount near Mt. Holly, New Jersey, was selected for the repeater and its 165 foot tower.

Although the apparatus was demonstrated successfully in 1933, using images with a fineness of 120 lines, tests soon convinced engineers that the relaying of television transmissions would have to be done at far higher frequencies than could be utilized at that time due to the lack of suitable vacuum tubes.

However, by the end of 1939, enough progress had been made in the development of new vacuum tubes for use at very high frequencies, and in the correlated development of radio repeaters and relay stations, to permit the establishment on Long Island of several radio relay stations operating in the vicinity of 450-500 megacycles. This relay system, which repeatedly "hopped" signals from the Empire State Building to a receiver in the RCA Laboratory at Riverhead, accommodated the full band-width permitted by television standards then in force. Later the addition of a third repeater station at Bellmore, Long Island, made it possible to relay signals from New York to Riverhead and back to Radio City.

A striking characteristic of properly designed radio relay systems, operating on frequencies above 500 megacycles, is that they require much less amplification in a given distance than concentric cable systems, when both are required to meet the present and future television modulation band-width requirements.

As television broadcasting moves to the higher frequency portions of the spectrum and as it becomes possible to include color, it is natural that the band-width required for transmission will be increased. For this reason it seems probable that radio relaying will receive greater recognition as the most promising means, technically and economically,




EXTENSIVE RADIO RELAYS OPERATING BETWEEN NEW YORK, EASTERN LONG ISLAND AND CAMDEN, N. J., IN 1939, LAID THE GROUNDWORK FOR NATION-WIDE RELAYS NOW IN PROSPECT.



ANTENNAS TOPPING HIGH TOWERS SIMILAR TO THE ONE SHOWN HERE WILL RELAY TELEVISION AND OTHER SERVICES ACROSS THE COUNTRYSIDE.

for the distribution of television programs.

In establishing a radio relay system, a major portion of the cost is represented by sites and towers. It is a fortunate circumstance that no development foreseen at present will destroy the value of these investments. Moreover, it is anticipated that future developments will make it possible to utilize higher radio frequencies thus providing more perfect reproduction of modulations without requiring substantial alterations in sites and towers.

Before the war the development of vacuum tubes and repeaters had been carried far enough to make it practical to utilize frequencies for television relaying in the range of about 300 to 1000 megacycles. It is anticipated that as soon as restraints due to the war are removed, the frequency range will be extended upward until eventually, frequencies of 3000 megacycles or more may be used.

### *Some Applications*

Since the only justification for investing large sums of money in radio relay systems, and for getting involved in the toils of technical development, business promotion and government regulation, is the usefulness of the systems, it is appropriate to consider some of the applications.

Radio relays have so many outstanding technical and economic advantages for television distribution that eventually they should be regarded as essential for this service. However, the costs of adequate radio relay systems are substantial and, unless the outlay for relay station sites, towers and facilities can be spread over a number of channels and services, the financial burden may delay the initial spread of television service.

In holding unit costs down, it is essential that the relay stations be designed and equipped to provide several television channels, all utilizing the same towers. It is also essential that investment and operating expenses be shared with as many secondary services as possible.

In general, relay stations will occupy the highest points of land or buildings and provide the highest towers in each community. They are therefore the natural choice for location of radio broadcasting stations. By combining relaying and broadcasting, where this is possible, both can benefit.

### *High Towers are Attractions*

High towers are natural gathering places for pleasure seekers and the curious. In many cases observation platforms, television theatres, restaurants and other entertainment facilities might be installed at the top of the relay towers to give a greater public service and to help in paying the costs.

One of the most natural secondary services, from a technical standpoint, will be that of facsimile communication, the transmission of any sort of picture or message which is to be recorded at the receiving end as a copy of the original. An adequate television radio relay circuit has a potential speed of transmission of 108,000 pages per hour.

There are as many uses for facsimile service as there are for existing telegraph and mail services. It is a means for giving the services with far greater speed and less effort. Soon, for example, facsimile could provide nationwide newspaper delivery faster than papers can now be printed.

There is another probably important use for future radio relay systems which is closely related to the struggle just beginning to obtain the use of frequencies above 30 megacycles. It is that of providing radio services to airplanes.

As airplanes increase in number, the demands for aviation radio service will increase to such a degree that it will be unreasonable to expect that radio frequencies and facilities can be provided so that all airplanes flying over land may communicate by radio over long distances. Furthermore, as the speed and efficiency of airplanes have increased, it has become more unreasonable to equip planes with either large protruding antennas, or powerful equipment, both of which are needed to operate on the frequencies required to reach great distances.

### *Looking to the Future*

Looking ahead it seems inevitable that much of the communication with aircraft must be limited to short distances and carried out on higher frequencies with more compact equipment and without protruding antennas. This will require a large number of ground stations, spread out along the air routes, and because these same routes will be followed generally by the radio relay systems, radio relay stations are natural sites for airline radio ground stations.

Railroads, long distance bus and truck lines and portions of the traveling public have communication needs similar in character to those of the airlines. Radio relay systems might very well contribute to the fulfillment of these needs.

To make radio relaying a great new American industry requires a more general understanding of its value; a well-defined and stable licensing policy; a relaxation of restraints which not only dampen the hope of expansion and profit but discourage joint action by those in need of relay service, and a few promoters who have caught the vision.



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# RADIO AGE

RESEARCH · MANUFACTURING · COMMUNICATIONS · BROADCASTING



RCA

JULY

1945




## THE NEW YORK CITY SYMPHONY CONCERTS DIRECTED BY LEOPOLD STOKOWSKI

★ While New Yorkers gathered at City Center to hear *Symphonies at Six*, other music lovers far away from Manhattan heard those brilliant concerts in their homes. NBC, through the facilities of its great New York station WEAF, was the only network to broadcast the winter season's Tuesday programs.

The New York City Symphony and its renowned conductor, Leopold Stokowski, increased NBC's contribution to fine music—added their talents to those of orchestras such as the Chicago, Baltimore, Indianapolis, Kansas City, Eastman School, and NBC Symphonies; men such as Defauw, Stewart, Sevitzky, Kurtz, Hanson, Ormandy, Black, Sargent and Toscanini.

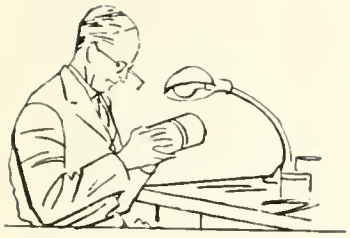
NBC pays tribute to all of these—and NBC honors the New York City Symphony for its cultural achievement in bringing great music to a great audience—not only in New York, but in the homes of those who make NBC *The Network Most People Listen to Most.*

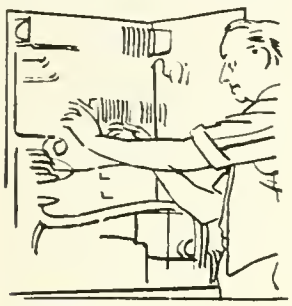
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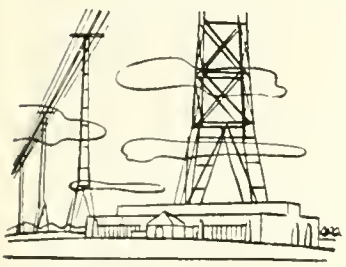
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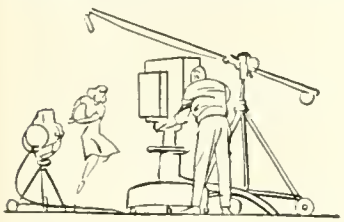
*1945—RADIO'S 25th ANNIVERSARY—PLEDGED TO VICTORY!*

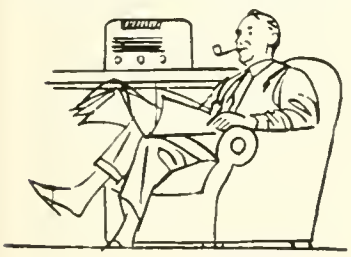
A Service of Radio Corporation of America











COVER — The Stars and Stripes and signal flags flutter from halyards against a background of radio antennas, blinkers and other forms of marine communications.

—U. S. Navy Photo.


# RADIO AGE

RESEARCH · MANUFACTURING · COMMUNICATIONS · BROADCASTING

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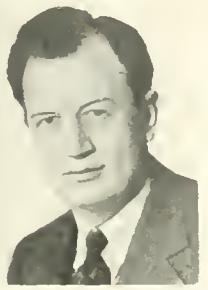
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WITH THE NEW YORK BLACKOUT ENDED, THE HUGE RCA SIGN ATOP RADIO CITY SHINES AGAIN, AFTER BEING "OFF THE AIR" SINCE DECEMBER 11, 1941.

# Television Dollars and Sense

*CONTRARY TO GENERAL IMPRESSION, BROADCASTERS CAN INSTALL AND OPERATE A BASIC VIDEO UNIT ON A SMALL INVESTMENT, TO BE INCREASED LATER, ENGINEER REVEALS*



By Philip Merryman

*Director, Facilities Development and Research, National Broadcasting Company.*

AT the beginning, I want to make it clear that I have no "prevision" on television. I have looked at the facts—learned by experience while developing sound broadcasting—and I have examined most of the evidence available, good and bad, concerning the problems we expect to meet in television. From these explorations I have drawn the conclusions that follow.

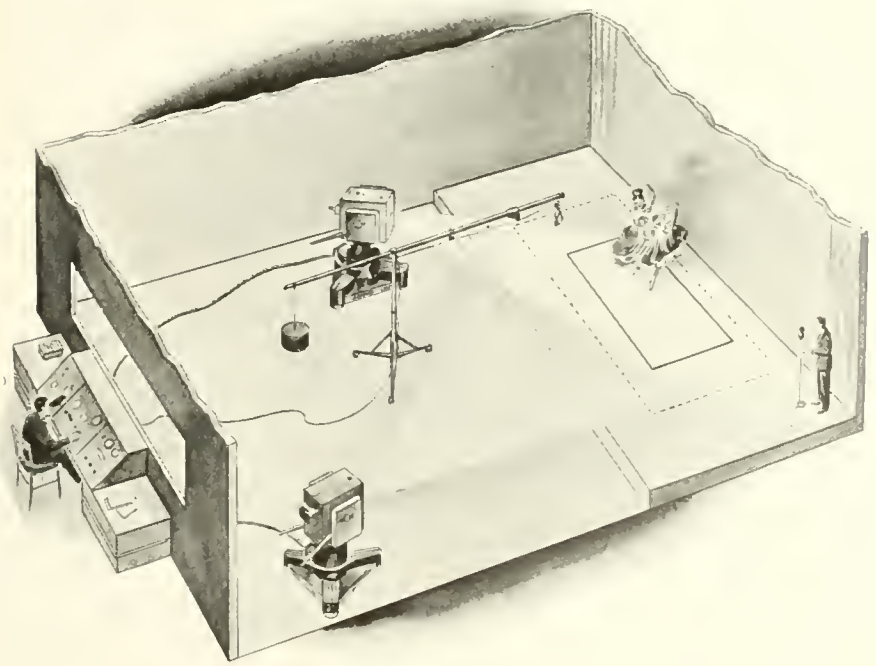
It is not my purpose to argue with anyone regarding the technical standards for television. That is a mental blind alley that yields little comfort to the careless thinker. For instance, I prefer to let the public decide whether six megacycle black-and-white television is satisfactory. Mr. and Mrs. Public will make the ultimate decision anyway. The pent-up demand for postwar television is apparently so great that it will reach flood-tide as soon as new sets appear on the market. If we are to deprive the public of these sets we need very convincing reasons. King Canute could not stop the tide. It is just as foolish to believe that television can be withheld from an eager public.

One fact is certain—a television picture cannot be evaluated in the same terms as an oil painting. Television pictures were not intended to grace the walls of the world's art galleries. They were created for the specific job of bringing into the homes and public meeting places, the living, vital, instantaneous reproductions of the pictures and sounds associated with interesting human or natural events wherever they may occur. Any attempt to evaluate the television picture on any other basis leads to fundamental errors of interpretation.

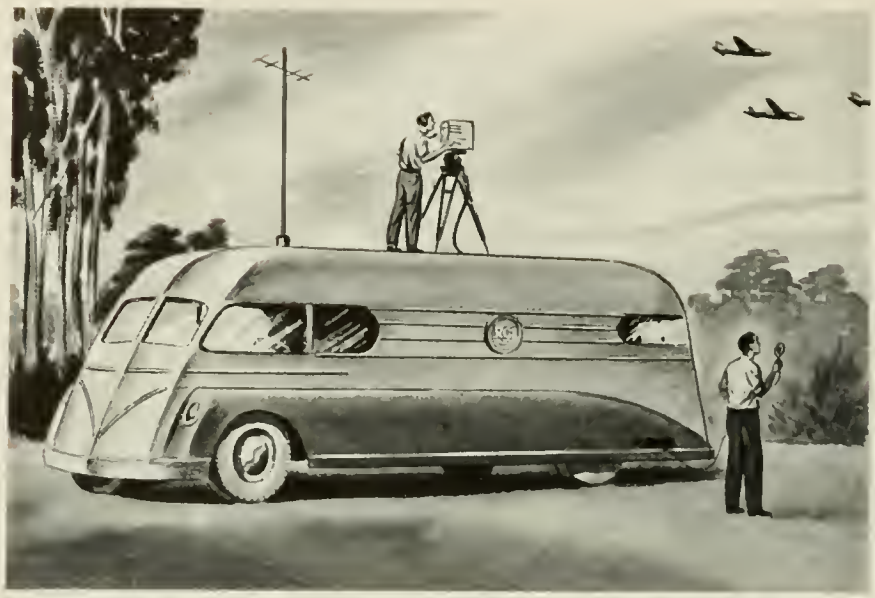
### *Flawless Image is Objective*

Of course, the television industry will not be content until it achieves a picture as flawless as nature itself but this ultimate goal cannot be reached through laboratory research alone. Like the automobile its final perfection will be attained only after millions of people have contributed to its improvement. The names of the engineers who have devoted major efforts to the development of television can be counted by hundreds—perhaps by thousands—but the names of the program, advertising and business men who have devoted creative thought to the development of a television service can be counted on the fingers of two hands. Television's real progress as a public service will begin when thousands of such men think constructively on television's problems.

Orderly progress in television is dependent on far more than the initiative of broadcasters. They cannot do the job alone. They must have the sympathetic support of all factions concerned. With little financial return from their pioneering activities at this time, any additional burdens the television companies are forced to bear because of the extreme demands of any group might easily retard the extension



IN THIS TYPE OF BASIC TELEVISION STUDIO, ONE ENGINEER AND AN ANNOUNCER SHOULD BE SUFFICIENT FOR NORMAL OPERATIONS. THE CAMERA IN THE FOREGROUND IS USED FOR LONG SHOTS WHILE THE OTHER GIVES CLOSE-UPS. EITHER MAY BE SWITCHED IN BY THE OPERATOR AS HE SCANS THE PICTURES PRODUCED BY EACH CAMERA ON HIS CONTROL BOARD. CAMERA AND MICROPHONE LOCATIONS ARE FIXED.



SPEEDY, COMPACT MOBILE UNITS, RUSHED TO SCENES OF ACTION, WILL COVER EMERGENCIES AND SPECIAL NEWS EVENTS FOR THE POST-WAR TELEVISION STATION. SIGNALS WILL BE FLASHED BACK TO THE MAIN STUDIO BY MICROWAVE TRANSMISSION.

of the service to the public.

Television is willing to pay a fair price for contributed services during the present developmental stage but if supporting costs are lifted so high that resources are threatened, the industry will face a critical situation. There must be fair play and generous treatment by all concerned if television is to become a national medium of entertainment with consequent opportunities for mass employment.

### *Sees 400 Cities With Television*

Last October in testimony before the Federal Communications Commission I stated that I believed television stations could be supported in towns having populations as low as 25,000. I submitted cost and operations statements to support my contention. I can now expand that statement to say that it is my belief that within ten years more than 400 cities in the United States will have television stations, all operating at a profit.

Unfortunately, sound broadcasters have been led to believe that the installation and operation of television facilities entail a very considerable outlay from the start. This is not so. Television programming can be started in a small way and expanded as receiving sets and commercial sponsors increase. How this can be done is suggested in the illustration on page 3. It will be seen that one operator, handling cameras and lights by remote control, would be sufficient for simple productions. By restricting their movements to the areas outlined, the actors would always be within the focus of the camera. The latter, once adjusted, would then operate unattended throughout the performance, eliminating need for an operator at each camera. If the announcer is to be visual, he would merely move from the position shown into the inner or outer staging areas as called for.

A studio arrangement such as the one shown, supplemented by one or two 16-millimeter motion picture projectors, would comprise all essential equipment for a start. As program time is increased and additional studio space secured, the transition from these limited facilities to those that will be required eventually could be carried out in gradual and logical steps.

Now what about the other advertising media — newspapers, magazines, car-cards, billboards, direct mail and so on? I predict that all of these media, including sound broadcasting, will be more prosperous than ever, even after television becomes a commonplace. It has been the history of advertising that no new form ever completely displaces the older ones. On the contrary, history reveals that the resulting increased volume of advertising increases the distribution of goods and services so that the overall national wealth is increased.

Between 1927 and 1943, for example, newspaper circulation increased from 63,000,000 to 82,000,000 and magazine circulation mounted from 36,000,000 to 63,000,000. This was the period during which broadcasting was growing most rapidly. There is no fundamental reason why this experience should not be repeated with television even though television should prove to be the most powerful advertising medium devised by man.

### *Cannot Copy Older Media*

Television programs cannot simply ape the older forms of entertainment if they are to fulfill their promise. Although the scope of program material available to television broadcasters will be fully as great as that now available to sound broadcasters, the technique of presentation must be different since the television broadcaster will be presenting pictures themselves — not just sounds which create mental pictures. The technique of the stage will not be suitable since television will use the world for its stage and the usual fifty- by a hundred-foot space behind the footlights will be only a small fraction of its area of activities. Nor can it be the technique of the movies, because television will broadcast events as they happen. Furthermore, there can be no takes and retakes which, after the final cutting, may lie in cans for months before they are released. No; television's technique must be different from any entertainment technique yet developed.

No one questions that television techniques will improve as time goes on, but that improvement will be made for six-megacycle television as well as for eighteen- and twenty-megacycle television. We don't know how long it will take to develop twenty-megacycle television. We do know that we can plan post-war television on the six-megacycle basis and every rule of common sense tells us that we should go ahead on that basis.

# CANADA'S NEW RADIO VOICE

*Two RCA Short-wave Stations Go Into Action At Sackville, N. B., to Carry the Dominion's Story to All Parts of the World.*

WITH the opening on February 25 of the first units of Canada's new shortwave plant at Sackville, New Brunswick, the Dominion joined the family of nations which are using radio beams to carry news and entertainment to soldiers on foreign soil and to promote good will among the citizens of other countries. Power for "Canada's Loudest Voice," as the new station has been called, is supplied by two RCA 50,000 watt transmitters, installed under the supervision of Engineers J. M. Conroy, F. Quance and Bud Seabrook of RCA Victor Limited of Montreal. A third RCA unit of 10 kilowatts power is expected to go into operation on January 1, 1946.

Travelers out of Sackville see the stations' tall towers rising from a salt marsh along the banks of the Tantramar River. The site was selected because of its freedom from unfavorable magnetic conditions and also because the moisture laden earth is helpful in the propagation of radio waves.

The transmitter building, located on one side of the 213 acre tract, is constructed of white stucco and tile. From it, long feed lines extend outward to three sets of directional antennas which have been positioned to cover all desired areas of the globe. Not only has each antenna been designed to radiate energy in either of two directions, 180 degrees apart, but the beam can be steered a few degrees to one side or the other of the normal direction merely by pressing a few buttons in the transmitter house. In this way, maximum power can always be concentrated along the great circle route which passes through the part of the world for which the program is intended.

### *Purposes of Plant*

Canada had several specific purposes in mind when the million dollar project was started. Like England and the United States, it wanted, first, to talk to its soldiers fighting overseas, giving them a constant flow of news from the homefront and the familiar type of entertainment they had enjoyed before their call to the colors. Canada also saw the advantages in placing the Dominion's point of view before the Allied nations of Europe. And finally, the people above the border were anxious to join their fighting allies in telling the enemy the real uncolored truth about the war's progress.

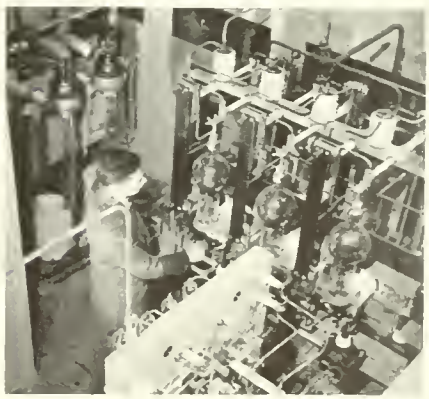
Further reasons for the short-wave development were expressed by Gerald Noxon, CBC commentator in a broadcast over the trans-Canada network:

"The rapid development of international radio under the stress of war," he said, "has opened up a new field of possibilities in the realm of international relations. Canada has now achieved a new importance in the world. We have our own responsibilities to bear in international affairs and our own purposes to further in the organization of world peace and world prosperity."

To man the station, Peter Aylen, CBC supervisor of international service, assembled a staff of expert writers and experienced linguists. Several of the commentators were refugees from enemy countries.

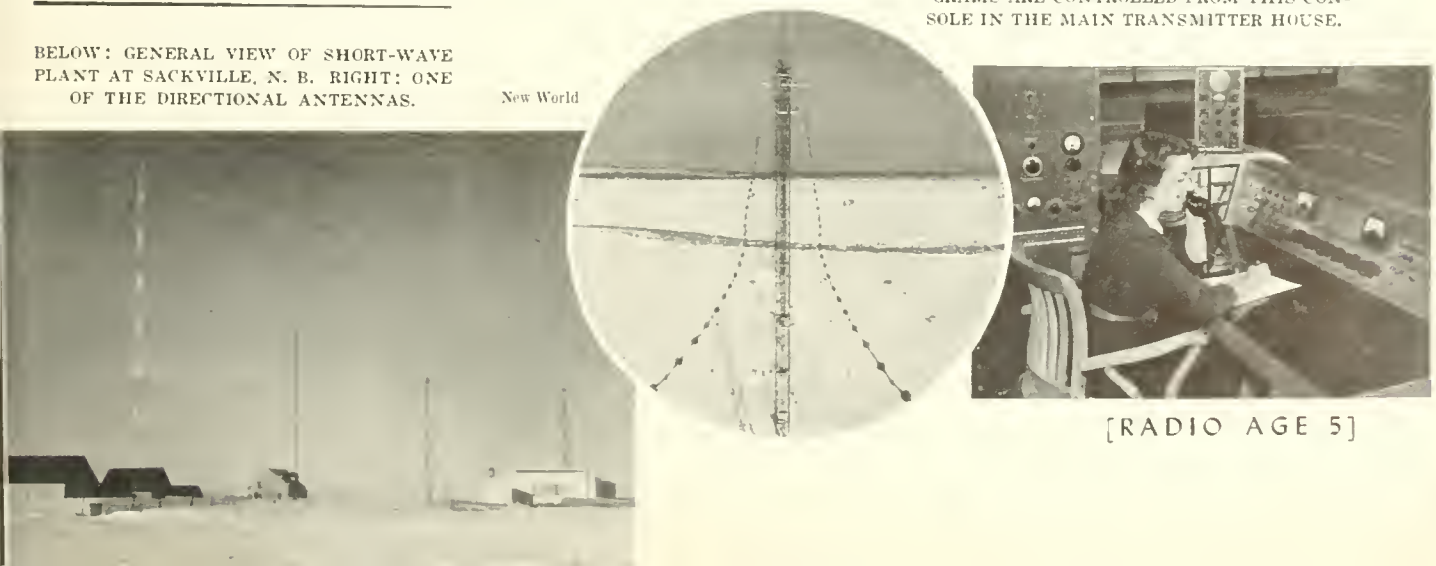
Up to this time, Sackville has not been in operation long enough for the program staff to round out its full schedule of multi-language broadcasts but before the summer is far along, the Voice of Canada will be heard regularly in Holland, Germany, Italy, France, West Indies, Mexico, South America, New Zealand and Australia.

V-E Day ended the need for certain types of programs but other features will be continued and expanded. Already from the two powerful RCA transmitters, Canada is sending the story of problems that affect the lives and welfare of her people, interspersed with accounts of the country's plans for social service, the promotion of industry and farming and the re-employment of returning veterans.

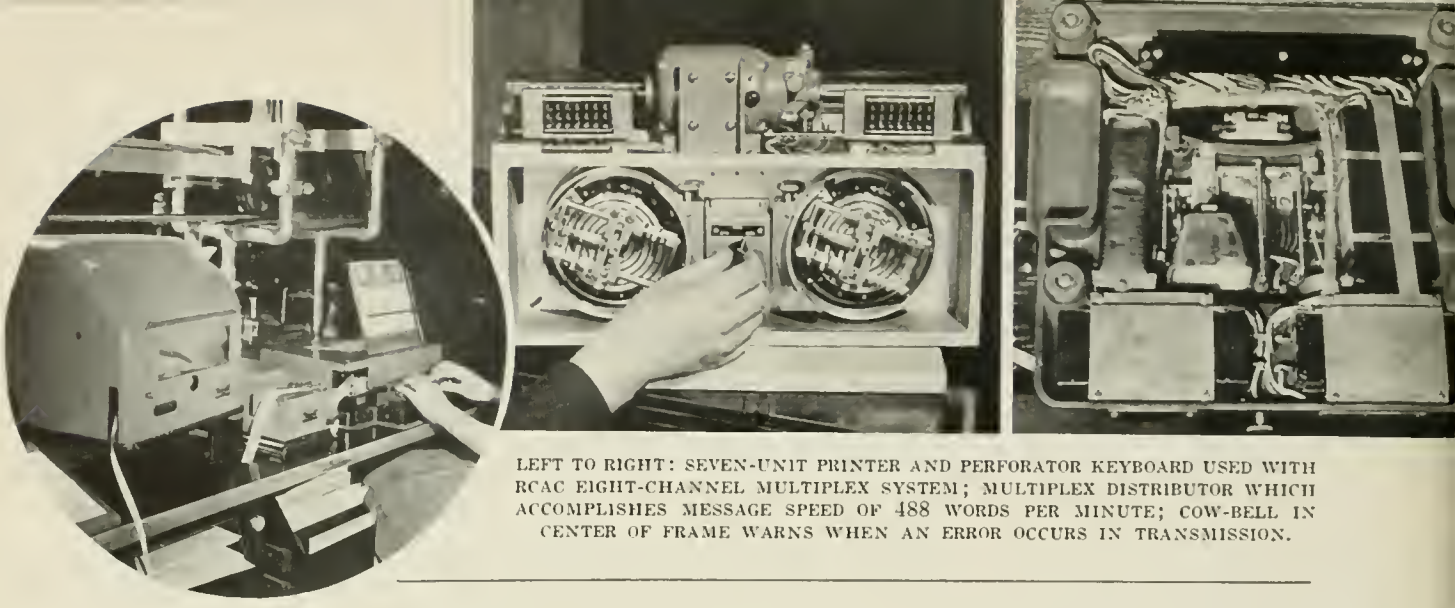


REAR VIEW OF ONE OF THE 50,000-WATT RCA TRANSMITTERS AT SACKVILLE. BELOW: ALL CANADIAN SHORT-WAVE PROGRAMS ARE CONTROLLED FROM THIS CONSOLE IN THE MAIN TRANSMITTER HOUSE.

BELOW: GENERAL VIEW OF SHORT-WAVE PLANT AT SACKVILLE, N. B. RIGHT: ONE OF THE DIRECTIONAL ANTENNAS.



New World



LEFT TO RIGHT: SEVEN-UNIT PRINTER AND PERFORATOR KEYBOARD USED WITH RCAC EIGHT-CHANNEL MULTIPLEX SYSTEM; MULTIPLEX DISTRIBUTOR WHICH ACCOMPLISHES MESSAGE SPEED OF 488 WORDS PER MINUTE; COW-BELL IN CENTER OF FRAME WARNS WHEN AN ERROR OCCURS IN TRANSMISSION.

# 8 MESSAGES—1 TRANSMITTER

*New Multiplex System Developed by RCA Communications Can Handle 488 Words a Minute Outward and Inward—Virtually Error-proof.*

DEVELOPMENT of a system of word transmission by which eight channels can be employed simultaneously to carry messages thousands of miles over a single radiotelegraph transmitter was announced on May 24 by Lieut. Colonel Thompson H. Mitchell, Vice President and General Manager of RCA Communications, Inc. The new system—regarded as a major advance in international communications—has been placed in operation between New York and London to increase communication capacity between the United States and Great Britain, and, with extension of channels to San Francisco, expedited the flow of government and press traffic to and from the United Nations Conference.

By means of specially designed RCA equipment which employs what is known in the industry as "time division multiplex telegraph" principles, the equipment can handle 488 words per minute inward and outward simultaneously, corresponding to eight channels each way with an individual channel speed of 61 words per minute. The equipment also permits operation of four or two channels instead of eight channels, when desired.

All eight channels may be utilized for two-way communication with one distant station. Alternatively, they may be set up in such a way that four channels with a total capacity of 244 words per minute may be operated in both directions simultaneously between two different stations, with automatic retransmission of one or more of the channels to a third station.

Moreover, printing mechanism incorporated in the new RCA multiplex system accomplishes the feat of making the circuit virtually error-proof, despite its high speed. Let any letter be mutilated or garbled in transmission and a warning bell rings under the receiving printer. At the same instant, in lieu of the mutilated character, a maltese cross appears to mark the exact spot of the error and facilitate correction.

### *System Virtually Error-Proof*

Colonel Mitchell, appraising the results, pointed out that it was appropriate for the world security parley at San Francisco to be served by the first operations of the new installation, since the chief aim in its creation was to help meet demands for increased communication and understanding between nations. As an example of mounting traffic accruing from America's enlarged scope of operations, the RCAC alone is expected to handle 200,000,000 words of world-wide communications this year, compared with 63,000,000 words in the pre-war year of 1938, an increase of more than 300 per cent.

While actual development of the new multiplex equipment began less than two years ago, it was disclosed that for some time before that date, RCAC research engineers had been working on kindred apparatus and had succeeded in achieving a high degree of efficiency in its use and in the use of the RCA Seven-Unit Printer employed in the new system. In fact the printer, which is an exclusive RCA development, has been employed continuously since 1939 for handling commercial traffic over the New York-San Francisco radio circuit.

This printer is completely automatic and through its use, in conjunction with the multiplex mechanism, the system functions with a minimum loss of circuit time, it was explained. Each incoming letter is comprised of three marking (signal) impulses, plus four spacing (no signal) impulses. The name—Seven-Unit—stems from this fact. Automatic counting features incorporated in the receiving printer check the arriving impulses, and if the marking impulses vary from three, the warning bell sounds and the maltese cross notes the error.

Although the new multiplex equipment is specifically designed to utilize the RCA Seven-Unit Printer System, it is also able to handle other telegraphic signalling codes. In fact, a different signalling code can be used if desired on each of the four pairs of channels forming the eight channel total.

Vital to the system is a newly

perfected method for keeping the receiving channeling devices in exact step with the distant transmitter and the signal elements being sent through the air.

Improvement in time division multiplex operation has been achieved through the inclusion in the same mechanism of the devices that perform the basic channeling function and also of the face plates which pass the signal elements from or to the seven-unit printing equipment in the proper sequence and at the right time intervals for transmission and reception.

In physical appearance, transmitting and receiving equipment used in the new RCA system varies only slightly from conventional radiotelegraph apparatus, in spite of its amazing performance. At each terminal of the circuit are two cabinet racks, 84 inches in height, each containing a multiplex distributor, visible about halfway between top and bottom. One rack is primarily for receiving and the other primarily for transmission. Other equipment includes printers, keyboard perforators and tape transmitters.

*Equipment Speeds Up Relays*

En route to London, traffic from San Francisco passes through the synchronized equipment in the New York office of RCAC, at 66 Broad Street, where the channels are separated automatically. Thence the messages flow, first, to the transmitting station at New Brunswick, then across the Atlantic. Routing from the British capital also includes passage through New York. Nevertheless, a mechanical delay of only one-sixth of a second occurs in the transmission in either direction.

It was pointed out that, while the system makes possible simultaneous transmission over four channels each way between San Francisco and London through New York, the routing may be shifted, for instance, to send messages from either metropolis to the Argentine over the three-channel New York-Buenos Aires circuit.

One of the valuable features of the new system in the opinion of RCAC engineers, is the use of bells for signalling. Each channel utilizes two of them. One rings only when an incorrect group of signal elements reaches the receiving printer. The other, of noticeably different pitch, is operated by means of a switch similar to a telephone dial. With it, the receiving operator can pass a number of stock phrases for service instruction to the other end of the circuit, thereby saving channel operating time.

# Outlines News Policy

## HEAD OF NBC NEWS AND SPECIAL EVENTS TELLS STAFF REPORTERS THAT NEW PLAN OF GLOBAL COVERAGE IS POST-WAR NECESSITY

As the world turns to peace, the flow of news from all parts of the globe will be greatly accelerated, in the opinion of William F. Brooks, NBC director of news and special events, who outlined the network's future policy in a statement recently sent to all NBC reporters. This quickening of developments, Brooks predicted, will continue for the next 3 to 10 years and will require a new type of news coverage.

"Censorship," he told his staff, "will be lifted shortly in many countries. Facilities which have been tied up by war needs will be freed. People who have been terrorized into speechlessness will once again speak. Equipment which has been impossible to get will eventually be ready so that microphones can be taken into almost any spot in the world. Two-way transmissions between the field and the home office again will be possible. All this will break some of the dams which have channelized news through the Army, Navy and other Governmental agencies, and enable the use of ingenuity and real thought in funneling happenings of the world through NBC."

*News Perspective Required*

The staff, he said, must have perspective and understanding of what this news means to the people of Terre Haute, Milwaukee and other typical American towns.

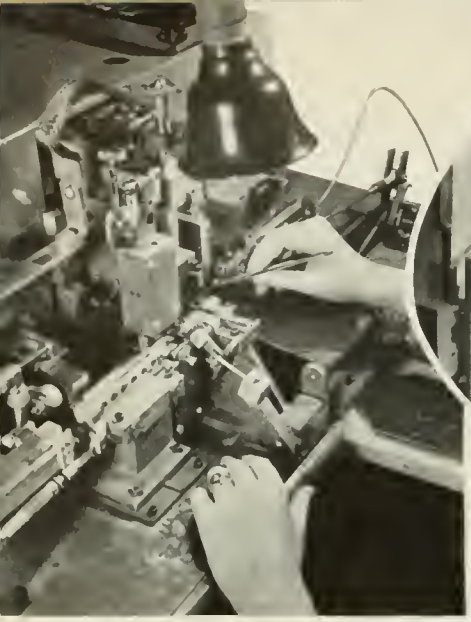
"We have a terrific responsibility along with the press to report and analyze in a completely impartial way happenings which at the time of their occurrence will be confused and obscure.

"We must not attempt to preach or crusade for causes which, however meritorious they may seem, have any selfish or underhanded motives. Ours is the job to report . . . and to report accurately and impartially. This is not an easy task, but if we exercise care and make sure that our staff is experienced and unselfish, we will make fewer mistakes. Transmission facilities which have been developed as a result of the war will give us here at home on-the-spot broadcasts of history in the making these next few years. We must have men who realize their responsibility, and who will dedicate themselves to this cause."

Radio, Brooks informed his staff, has built up an audience which depends on radio reports for a good percentage of its information.

"The past five years," he said, "have ingrained news listening habits into the people of this country in a way which was never envisioned before. The National Opinion Research Center at the University of Denver has recently completed a poll which shows that 47 percent of the people get most of their news from radio and that 46 percent believe that radio news is more accurate."

As a specific move to lay the foundation for the new regime, the NBC head announced shifts in personnel which will place the men in key news-centers where their experience and contacts will keep "the National Broadcasting Company out in front in the future as it has been in the past with accurate, reliable and comprehensive on-the-spot reports."



TABS ARE PLACED ON FILAMENTS IN THIS MACHINE.

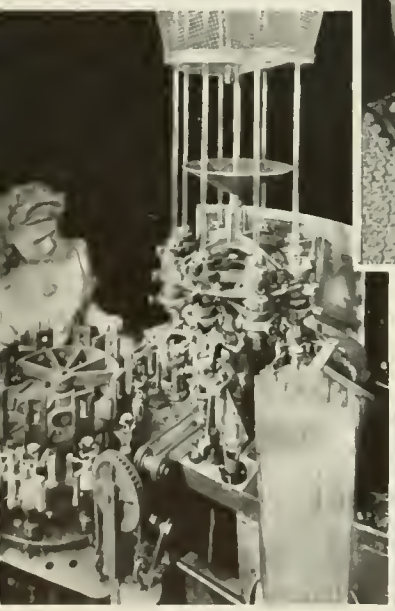


TURE PARTS ARE HEATED TO HIGH TEMPERATURE IN THIS HYDROGEN OVEN.



MINIATURE TUBES AN MOUNTINGS UNDERGO CO STANT INSPECTION.

THIS MACHINE MAKES BULBS FOR THE RCA "ACORN" TUBE.





CEMENTING CERAMIC INSULATION FOR MINIATURE TURES.



HAIR-LIKE TUNGSTEN WIRES ARE FOLDED INTO SHAPE ON THIS MACHINE.

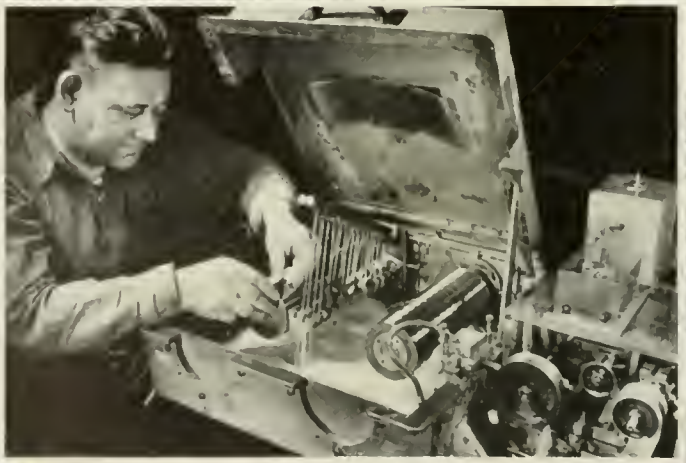
TUBES ARE GIVEN FINA TESTS BEFORE SHIPMENT



# MAKING RADIO TUBES AT RCA VICTOR DIVISION

IRCULAR JIGS SPEED UP THE "THREADING" OF METAL TUBES.





FILAMENTS OF FINE WIRE ARE DRAWN IN THIS MACHINE.

AN OPERATOR FEEDS MINIATU TUBES INTO THIS REVOLVING SE ING DEVICE.



HARRISON, NEW JERSEY

# MUSIC IS A WAR WEAPON

*Special Recordings for Armed Services Designed to Weaken Spirit of Enemy and Bolster Morale of Our Soldiers and Sailors.*



By William R. Seth, Jr.

*Director, Advertising and Promotion, NBC Radio-Recording Division*

THE siege of Cherbourg had been hard and costly. American forces had overrun most of the great French port but German artillery and mortar fire was still plastering the city. In the midst of this holocaust a radio, beamed at the German lines through powerful loud speakers, blared forth with popular melodies. As the music faded, a Yank announcer commenced to talk. He described the futility of further enemy resistance and exhorted the Germans to lay down their arms. Soon the gun-fire stopped and the enemy began to surrender. Once again, the effective combination of music and words had demonstrated its potency as a weapon of war.

How did this music get into the front lines of such an important battle? There were no musical instruments, no musicians on the spot. But many weeks before, instruments and musicians had been assembled in an NBC studio back in New York. They had played these tunes which the enemy heard through the loud speakers and every note had been truly recorded on thin black discs.

On all fronts, NBC-RCA recordings have played and are still playing an essential part in the lives of fighting men. V-disks, training records and full length recorded shows are doing the job in camps and often in the forward battle areas. On the domestic scene, entire NBC Recorded War Bond campaigns, used on hundreds of broadcasting stations, have urged the public to invest in government securities as a war measure. Recruiting programs for the WAC and WAVE, vital messages from the OPA, War Manpower Commission, Office of Economic Stabilization and many other important Government Departments have been brought into American homes through the medium of radio recordings produced and manufactured by NBC and RCA Victor.

Especially recorded for GI's overseas are such well known radio shows as "Command Performance," "Mail Call," "GI Jive" and "Jubilee." Prepared under the supervision of the Armed Forces Radio Service and recorded by the NBC Radio - Recording Division, these programs are taking radio's finest talent to our fighting forces wherever they may be stationed.

### *Best Talent Makes Recordings*

American soldiers confined to German concentration camps were entertained by a series of programs supplied by the War Prisoners' Aid of the Y.M.C.A. and recorded by NBC. While waiting release from their days and nights of boredom, officers and GI's alike were sustained by such network shows as the "Hour of Charm," "Cavalcade of America," "The Eddie Cantor Show" and many others.

Of the numerous services offered by Radio-Recording, the NBC Thesaurus musical program service is probably the best known. Leased to radio stations in all accessible countries, this library of recorded music provides the finest musical talent in the field for local broadcasts. Some 250 U.S. stations currently are using Thesaurus as a basis for much of their musical programming. Many of them build local shows with the scripts which are supplied as part of the service.

One of the most recent and successful additions to Thesaurus is "The Music of Manhattan," a musical program consisting of a basic 28-piece orchestra of radio's finest musicians supported by a corps of outstanding arrangers and including many specialty ensembles. This organization gives Thesaurus subscribers the finest in exclusive music, patterned for local broadcasting requirements.

Some of the top-notch musical artists represented in the library are Vincent Lopez, Ted Steele, Edwin Franko Goldman, Xavier Cugat, Allen Roth, The Golden Gate Quartet, and Norman Cloutier.

### *Programs Are Syndicated*

Syndicated Programs represent another major expansion of the Division's products. These are recorded radio shows of network caliber produced for sponsorship on local stations.

Custom-built programs, spot announcements and instantaneous recording fall into another interesting category of activity at NBC Radio-Recording. These include programs built for an advertiser for selected broadcasts in various markets throughout the country.

New technical improvements already incorporated in NBC transcriptions have noticeably improved the program standards. Yet these are only a promise of the many quality achievements that will be realized in the post-war world.

A COMPLETED TRANSCRIPTION IS INSPECTED FOR FLAWS IN RECORDING.



# TELEVISION SCENERY DESIGN

*WNBT Staff Evolves Novel Method of Erecting Stage Settings by the Use of Interlocking Units—Idea Cuts Costs and Speeds Construction.*



By N. Ray Kelly

*Manager, Television Production Facilities,*
*National Broadcasting Company*

IN planning television studio facilities at NBC, it was recognized at the beginning that the economical design and construction of scenery was to be a problem that would grow in importance with the expansion of program schedules. The reason for this lies in the fundamental nature of the new visual medium. Unlike the legitimate stage or the movies, a television show is seldom produced more than once. The cost of stage settings therefore, cannot be spread over numerous presentations but must be charged against a single broadcast. For that reason, it was obvious that anything that could be done to reduce the interval between the decision to produce a play and the actual production would contribute toward a lower over-all cost.

Standard sound broadcasting escapes this problem because there the imagination of the listener, aided by the lines of the actors and accompanying sound effects, create the setting. But television can mask nothing. The viewer sees all and is stimulated to the maximum dramatic reaction only when the background of the scene is strictly in keeping with the action taking place on the television screen. This means that new stage settings, freshly decorated, should be devised especially for each production. Under such circumstances, the preparation and erection of scenery may account for an appreciable part of the total cost of the show.

### *Units Are Interchangeable*

Realizing these limitations, the NBC television staff, more than a year ago, began a study of the subject, out of which came the unit structure of scenery design now in constant use. The basis of the plan are interlocking panels and connecting parts which can be assembled to produce an unlimited number of different stage settings.

The mechanical construction of each unit follows a specific pattern. A ridge along one edge of each section fits into a corresponding groove on another unit and the joint is held firmly by clamps or bolts. This bead-and-slot, functioning like the "tongue" and "groove" of wood flooring, insures rigidity of long wall surfaces and prevents buckling when weights must be suspended from the flats.

Erection of unbroken walls can be carried out rapidly with these units. The standard panels are placed edge-to-edge and clamped in position. Narrow connecting strips of various dimensions and contour allow for the formation of room corners and angular changes in wall surfaces. Where the scenery design specifies an opening for door or window, this is taken care of by special units. These individual units may also be mounted horizontally, rather than in a vertical position to provide parapets, lintels, wide-arch openings of various sizes and forms, store counters and hotel desks.

### *Wall Openings Easily Formed*

The small units, normally used to form corners and odd wall surfaces, may also be combined to provide columns in numerous sizes, pilasters and buttresses. But the wide flexibility of the units really becomes evident in making windows and doors. Illustrations on these pages show how individual units have been assembled to provide either a standard window, a Gothic or a bay window. Just as easily, a wall opening may be made to accommodate a full size door, or the space can be partially blocked off to become a window of prescribed size and style. New ways of combining the units are revealed with each new production.

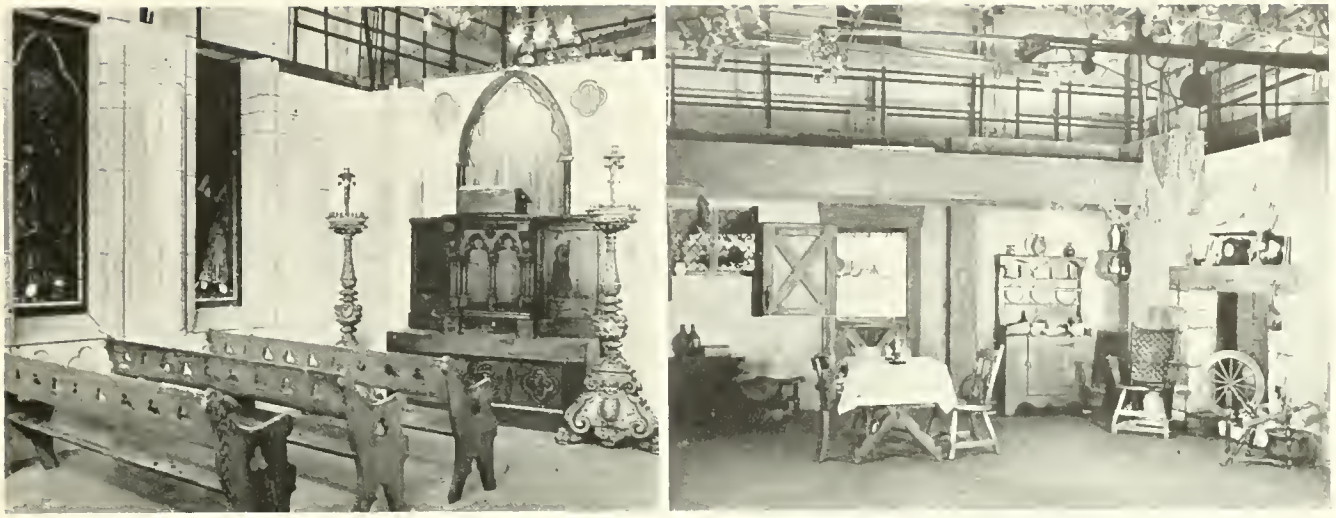
From time to time, as the need arises, special elements, such as period windows, doors, mouldings and modeled detail of various types, are added to the existing stock of scenery, thus providing an ever-increasing versatility in set con-

RIGHT: A TYPICAL TELEVISION SETTING FORMED BY COMBINING A NUMBER OF INTERLOCKING UNITS.

BELOW: STAGE HANDS MATCH "TONGUE AND GROOVE" OF SCENERY UNITS IN SYSTEM DEVISED BY NBC FOR THE RAPID ERECTION OF TELEVISION STAGE SETTINGS.







THESE STAGE SETS ILLUSTRATE THE VERSATILITY OF THE NEW UNIT STRUCTURE IN BUILDING WALLS, GOTHIC WINDOWS, DUTCH DOORS AND FIREPLACE OPENINGS. THE SAME UNITS ARE APPLIED IN VARIOUS WAYS ACCORDING TO THE DESIGN.

struction. All new features, of course, embody the same basic interlocking idea which is the key to the system.

However, stage scenery, to be practicable, must do more than merely serve as background. It must be sufficiently sturdy to serve as a support for essential properties, yet possess the characteristics of portability and flexibility to permit re-combination as required. These advantages and many others are embodied in the unit structures.

Formerly, it was necessary to build at least 50% new scenery for each production. The new units eliminate much of this waste. They are built of three-ply panels and can be used repeatedly. By covering them with canvas they may be redecorated as often as needed, with paint or wall paper. Each unit is braced and counter-braced to provide a strong support for balconies or other hanging properties.

Fireplace openings, Dutch doors, archways and porch entrances are merely a few of the variations in stage architecture that have been fabricated by matching the proper units.

It is interesting to note that in adopting these unusual structural units, television seems to be favoring the Hollywood rather than the Broadway stage technique. Whether or not this should be considered a trend of television development will be revealed in time. Experience gained so far indicates that television will continue to borrow worthy ideas wherever they may be found, adapting them, as in the case of NBC's unit scenery construction, to the special needs of the industry.

NBC'S TELEVISION CREW SETS UP ITS CAMERA EQUIPMENT IN TIMES SQUARE TO CATCH THE STIRRING CROWD SCENES OF V-E DAY.




## Viewers Want Sports

Ninety-seven percent of the television set owners in the metropolitan area recently polled by NBC approved the sports programs picked up at Madison Square Garden and St. Nicholas Arena, and transmitted over station WNBT. Ninety-four percent of the responses accurately identified the sponsor of the bouts.



NBC'S TRIO OF WOMEN ENGINEERS IN STUDIO CONTROL ROOM. LEFT TO RIGHT: MARJORIE ALLEN, KATHERINE REYNOLDS AND RUTH THOMAS.

# Women in Radio

*WARTIME BRINGS OPPORTUNITY TO TRIO WHO MAKE THE GRADE AS FULL-FLEDGED ENGINEERS IN NBC CONTROL ROOM.*

A GROUP of actors entered an NBC studio in Radio City several months ago. The director pulled a script from his pocket and motioned towards the mike. "Let's run through this once, cold," he said, "then I'll make the cuts before we go into the 'dress'."

As an after-thought he glanced into the control room. Seeing only a girl there he remarked, half to himself and half to the players: "Wonder where the engineer is? He ought to be here by now." Through the sound-proof glass, he made expressive motions with his hands, indicating, he hoped, that she should tell him where the engineer was.

The girl understood the sign-language. She walked to the panel board, plugged in a patch cord, dialed power into the studio mike, and said tersely: "I'm the engineer on this show today." And that was that.

### *War Created Opportunities*

All of which points to the fact that today women are in radio on both sides of the control board. At the present moment, there are three full-fledged engineers on the staff of the National Broadcasting Company. Marjorie Allen, Katherine Reynolds and Ruth Thomas are the three newcomers whose presence in Radio City makes NBC the first network in the United States to have women engineers putting network programs on the air. Their opportunities to invade a man's world arose when the war emergency cut sharply into the ranks of radio engineers, just as it has in practically every other technically exacting profession in industrial life.

### *Inherited Mechanical Aptitude*

Ruth Thomas inherited her aptitude for things mechanical from her father, an aviation engineer. Born in Woodstock, New York, she was graduated from New York University where she took courses in radio production and script writing. The course in theory, which has stymied many a male student, made such a favorable impression on her that she decided some phase of broadcasting was to be her life's ambition. Miss Thomas, pretty, blue-eyed and brunette, landed a job as an apprentice engineer on another network in New York. Four months later, she went to the OWI as studio engineer to handle shortwave broadcasts to Europe and Africa.

Katherine Reynolds, tall, slender and blonde, was born in Little Rock, Arkansas, and moved to Dallas, Texas, when she was five. After graduating from Buckner Academy, Dallas, she worked as a stenographer and secretary. When war was declared, Reynolds enrolled in a radio course at Texas Christian University, and at its completion landed a job as a radio engineer at Station WBAP, Fort Worth, Texas.

Miss Reynolds re-enrolled at T.C.U. in 1942 to work for her engineering degree, while continuing as an operator at night. Two years passed. Then came the urge to see New York. Her next stop was at NBC as an apprentice engineer.

### *Versatile Work and Avocations*

Marjorie Allen, last of the trio to complete her apprenticeship at NBC, has been equally versatile in her life's work and avocations. Born in New York City, she was graduated from the Gardiner School for Girls, attended Skidmore College and graduated from the American Radio Institute.

Marjorie is believed to be the first woman radio transmitter engineer in the East. It happened this way. The chief engineer at Station W47NY, FM station in New York, was in need of an experienced engineer. The chief wasn't too impressed until he saw her work. Then he changed his mind.

Miss Allen joined NBC in February, 1945. Three and a half months later she became a full-fledged studio engineer. Her views on the permanence of women in the field of radio engineering are revealing and provocative. In a recent interview with a feature writer of the Associated Press she said that it is possible for women to make better studio engineers than men.

"They have a sensitive touch," she added. "They put their heart and soul into their work."

# Glass Loses Its Glare

## METHOD OF SURFACE TREATMENT DEVISED FOR TELEVISION USE MAY HAVE MORE IMPORTANT APPLICATIONS IN EVERYDAY LIFE



By Dr. F. H. Nicoll,
*RCA Laboratories, Princeton, N. J.*

TO the layman, glass is a substance through which light-rays pass without difficulty. To the physicist, this common conception is not wholly true. Under certain conditions, an appreciable part of the light striking a sheet of glass does not pass through but is reflected from the outer surface, as by a mirror. It is this characteristic of glass that is undesirable in many applications, particularly in television.

The relationship between low-reflecting glass and television is not readily apparent but our work in this field was nevertheless initiated with a view to providing a glass surface which would be free from glare and extraneous reflections and would help to produce better television pictures by improving contrast. Possible applications for the process are, however, far from limited to the field of television.

Although, in recent years, many processes have been proposed for reducing the reflection from glass, RCA became interested in the problem some years ago when the field was comparatively new. At that time experiments were initiated in our laboratory along the lines suggested by some early literature on methods of dissolving glass.

One solvent for glass, which is known better for its effect than by its name, is hydrofluoric acid. Its action on glass can be observed in the common electric light bulb. Here the acid is used to produce a rough, diffuse surface. The papers of Lord Rayleigh, a great English scientist, revealed that as early as 1900 he had observed that very weak solutions of the acid would remove a few millionths of an inch of glass and still leave the surface of the glass smooth. Since it was known theoretically that glass reflections could be reduced if the surface was altered in the correct manner, it was, therefore, of interest to observe whether the action of the hydrofluoric acid had any effect on the reflection.

### *Secret Found in Use of Vapor*

The experiments of Lord Rayleigh were repeated, but the glass was exposed to the vapor of the solution as well as to the liquid. Lord Rayleigh's results in the liquid were confirmed, but what was much more important to us, our hopes had been realized in the vapor. The glass in the vapor had become low-reflecting. This first piece of low-reflecting glass had an area of only a small fraction of an inch but it was enough to stimulate further work. From this small beginning it has now become possible to treat pieces of glass three feet square or even larger. The time of treatment, which was originally many hours, has now been reduced by a large factor.

It took a considerable period of concentrated research to discover just why the reflection was reduced and how the acid vapor was able to produce such a result. It is now known that the acid vapor removes only a part of the glass and does this to a depth of only a few millionths of an inch. This surface layer is rather like a sponge or sieve. The holes are actually too small to be seen in an ordinary microscope but the electron microscope developed by RCA has made them visible.

### *Treated Glass Has Many Uses*

The possible uses of low-reflecting glass are many. Wherever one wishes to look through glass without being bothered by reflections, treatment of the surface by the method described above will greatly increase visibility. Meter faces, clock crystals and picture cover glasses are all possible applications, and samples of many of these have been made.

The future for low-reflecting glass looks promising. The use of such glass in various manufactured articles may prove advantageous in a competitive post-war market. As the demand for glass treated by the RCA process grows larger, the Company again will receive credit for a development which, though not in the field of radio, will make for better and more comfortable living.



THE AUTHOR (LEFT) AND DR. S. M. THOMPSEN PREPARE AN EXPERIMENT IN THE REDUCTION OF REFLECTIONS FROM A GLASS SHEET.

# SHARE-WORK PLAN SUCCEEDS

*Typists and Clerks in Insurance Office Become Part-Time Workers on Radio Components in Novel Project Sponsored by RCA and Prudential.*

TYPISTS and office clerks for four hours; assemblers of radio tube parts for the remainder of the day—that is the unusual but regular routine of nearly a hundred employees of the Prudential Insurance Company of Newark, New Jersey, who form the nucleus of a unique manpower sharing plan operated cooperatively by the insurance firm and the Radio Corporation of America. By installing the factory operation of a war manufacturer on the premises of a civilian-essential company where part-time labor is obtainable, the plan taps a new source for war labor, providing additional man-hours of needed production. The arrangement is seen as a pattern for adoption in areas of critical manpower shortage.

Forty Prudential girl typists and clerks, working in two shifts of four hours each, comprised the group assigned originally to the RCA tube assembly operation. However, both companies expect eventually to have 200 girls on the job as special work benches become available.

Pointing out that this number of workers will provide nearly 5,000 man-hours of new production each week, L. W. Teegarden, General Manager of the RCA Tube Division, estimated that the Prudential project will enable RCA to increase by 25 percent its output of urgently needed miniature tubes for radar and other radio and electronic equipment. It represents, he said, one of numerous measures undertaken by the Corporation to meet increased Government requirements for miniature and other electron tubes.

### *WMC Approves Plan*

The plan was originated by Robert M. Green, Prudential Vice-President in charge of personnel, and has been approved by George Pfaus, Newark Area Director of the War Manpower Commission.

Advantages of the plan, it is pointed out, are many. The armed services get additional material. The war manufacturer is supplied with more workers ready for production after a nominal training period, and also with convenient working space and other facilities. The civilian-essential industry is enabled to keep its organization intact, continuing to utilize the participating employees on a part-time basis thus avoiding the loss of experienced personnel. The workers are given an opportunity to participate in war production without giving up their regular jobs.

The work at the Prudential-RCA project is a simple, clean operation consisting of assembling the "cages", or inner parts, for RCA's miniature electron tubes. These tubes, about the size of a peanut, are used in the Army's famous walkie-talkies, the paratrooper's handie-talkies and in aircraft radar equipment.

Retained on the Prudential payroll on a part-time basis, the girls are placed on the RCA payroll for the rest of their work-day, receiving wage rates that prevail for similar work at the company's tube manufacturing plant at nearby Harrison. Under another feature which considers the convenience of workers, RCA has rented floor space in one of Prudential's buildings, where the necessary benches and equipment have been installed.

The plan was presented to the Prudential employees on a purely voluntary basis, according to Mr. Green. An initial group of 200 girls in wage brackets comparable to earnings on the RCA project, attended a rally at which the plan was outlined. Within 48 hours, ninety-six girls, almost 50 percent of the group, had volunteered for the war work.

### *RCA Provides Instructors*

Two shifts were organized. One group works for RCA from 8 A.M. to noon and for Prudential in the afternoon; the other group reports to its regular jobs in the morning and replaces co-workers at the RCA project from 12:40 to 4:40 P.M. The Radio Corporation of America assigned instructors to provide on-the-job training.

Although the girls were inexperienced in this type of work, production got off to a good start. Within 10 days after they reported for duty the girls were "on their own," requiring no more supervision than is needed for experienced assemblers.



INSURANCE OFFICE EMPLOYEES CONTRIBUTE TO THE WAR EFFORT BY DEVOTING PART OF THEIR TIME TO AN RCA TUBE ASSEMBLY OPERATION.



THREE LATE-MODEL KINESCOPES FOR TELEVISION. LEFT TO RIGHT: 5-INCH FLAT-FACE AND 3-INCH FLAT-FACE FOR REFRACTIVE SYSTEMS; 5-INCH CURVED-FACE FOR REFLECTIVE OPTICAL SYSTEMS.

# TELEVISION PROJECTION TUBES

*Design of 5-Inch Kinescope for Large-Screen Home Receiver Involved Long Study by RCA of Glass, Phosphors and Electronics.*

WHEN representatives of the press witnessed the first public demonstration of RCA's advanced development model large screen television receiver on March 15, they gave unanimous praise to the size, brightness and clarity of the picture. But few of the observers realized the number and complexity of the problems that had been met and solved in the long process of producing a practical instrument.

The earliest television images were about 1 inch square and were poorly lighted. The latest model has a picture area 350 times larger with illumination that compares favorable with that of theatre movie screens and well above that of the average home movies. How that progress was made is a story of carefully planned research conducted at the RCA Laboratories, Princeton, and at RCA Victor Manufacturing plants.

The problem of providing a television image large enough for comfortable viewing by a group of people was on its way to solution before the war when RCA introduced a receiver with a 12-inch kinescope which provided a 7⅜ by 9¾ inch image. While it is believed that this size picture will continue to satisfy many users, there will also be a definite demand in post-war days for a deluxe-type receiver having a much larger image.

### *How Image Size is Increased*

Larger television images may be produced in two obvious ways. The kinescope tube diameter may be increased for direct viewing, or the image from the face of a smaller tube may be projected through a suitable optical system. Sealed-off glass tubes as large as 24 inches in diameter have been made but unfortunately glass is not a good structural material for such large kinescopes. As the size is increased, the glass must be made very thick and the viewing screen must be made nearly spherical in order to withstand the atmospheric pressure.

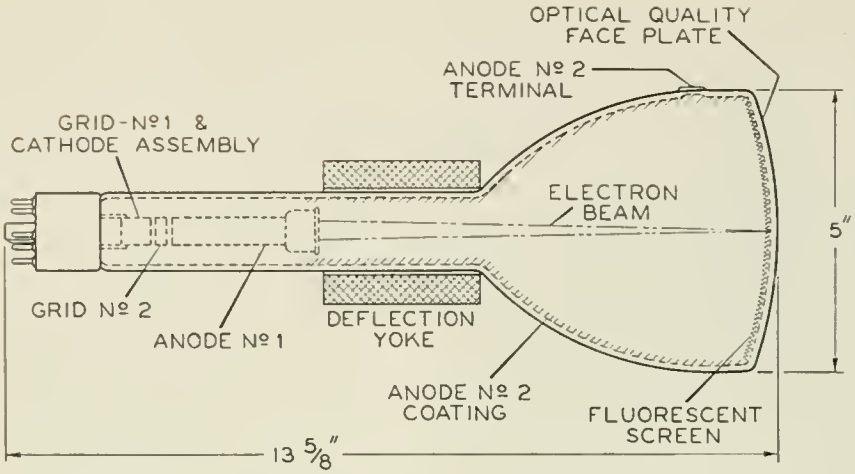
The technique of motion picture projection led investigators to the idea of projecting large television images from a kinescope. But here, another problem appeared. Few people appreciate the low efficiency of a projection lens in transmitting light. An f4.5 lens, for instance, is considered fast; an f1.5 lens is in the realm of super-speed. Yet the former transmits only about 1/200th, and the latter only 1/25th, of the available light. Thus, even with the f1.5 lens, the image on a kinescope would have to be so brilliant to begin with that four percent of it, when spread over a screen surface 30 times greater than the tube face, would still supply a screen image of satisfactory brightness.

How well these difficulties were overcome is evident in the fact that the RCA reflective optics system, the heart of the large-screen television set, has an efficiency four times that of previous fast projection lenses.

### *Three Factors Govern Design*

Three basic factors govern the design of a satisfactory projection kinescope: the electron gun, which generates the electrons, controls them, accelerates them and focuses them into a beam; the fluorescent screen and the over-all cost of the unit.

Since the brightness of fluorescent screens increases rapidly with the voltage used in the tube, the 5-inch developmental projection type used in the RCA receiver operates at 27,000 volts. This compares to the 7,000 volts of the 12-inch kinescope. The presence of the high voltage introduces numerous other difficulties which have been overcome by continued research. For one thing, the surface of many elements within the tube must be highly polished to prevent the emission of unwanted electrons. If not suppressed these faults would affect




CROSS-SECTION OF 5-INCH CURVED-FACE KINESCOPE USED IN RCA'S DEVELOPMENT MODEL PROJECTION TELEVISION RECEIVER FOR HOME USE.

the quality of the screen picture. Such important items as the focussing of the electron scanning beam —in the 5-inch tube it is only 0.005-inch in diameter — have been gained, not through radical changes in gun design, but by refinement of parts and accurate control of mechanical dimensions. The result is an electron gun which generates the desired beam of electrons, modulates its intensity to conform to the picture signals and streamlines the beam to the ithnness of a human hair, so that it can be moved back and forth across the screen along a path directed by signal pulses from the transmitting station.

### *Screen Determines Tube Life*

The fluorescent screen determines the life of the projection tube. Years of research were necessary before a suitable phosphor was developed that would withstand the high voltage of the scanning beam. It is interesting, however, to observe that the actual time of electron bombardment of the screen is extremely brief compared to the life of the tube. For an assumed tube life of 500 hours, the screen is bombarded for a total time of less than six seconds. This sound incredible but a few figures will prove the statement's accuracy. At any instant during use, the electron beam covers only one picture element. Since there are about 300,000 picture elements in a 500-line picture, any particular element is bombarded for only 1 300,000th of the time. 500 hours amount to 30,000 minutes; therefore, the actual time of bombardment is one tenth of a minute or six seconds. Actually the picture is black at least half the time so the bombardment period of any element may be less than three seconds for a tube-life span of 500 hours.

The size of the fluorescent screen is closely related to the cost of a projection optical system. While the available light increases with the size of the tube, the cost of both tube and lens rises rapidly when the tube diameter goes above 5-inches. Conversely, little is saved on smaller tubes; hence the 5-inch tube works out as an economical choice. However, it is expected that a three-inch tube will also be available for use where a more compact, lower-priced projection receiver is desirable.

Present models of home projection kinescopes are of development design. Further refinements will be made before they are produced commercially. However, results already achieved through these early models promise a satisfactory solution of one important part of the problem of producing television pictures sufficiently large and clear for use in the home.

## Folsom Made Executive V. P. In Charge of RCA Victor

Frank M. Folsom, Vice President in Charge of RCA Victor Division since January, 1944, has been elected Executive Vice President in Charge of RCA Victor Division, it was announced by Brigadier General David Sarnoff, President of Radio Corporation of America, following a meeting of the Board of Directors on June 1. At the same time, John G. Wilson was elected Operating Vice President of RCA Victor Division.

Mr. Folsom joined RCA after serving in Washington as Chief of the Procurement Branch of the Navy Department. In addition to being in charge of RCA's manufacturing division, he is a Director of RCA and of the National Broadcasting Company. Before entering Government service, Mr. Folsom was Vice President in Charge of Merchandise and a Director of Montgomery Ward & Company.

Mr. Wilson has been in charge of financial administration at the RCA Victor Division for the last year. He came to RCA from Chicago where he had been Executive Vice President of the United Wallpaper Company. Previously, Mr. Wilson served as Assistant Controller of Montgomery Ward & Company.

## Wins Fourth Star

A fourth star for continued outstanding achievement in the war effort has been added to the Army-Navy "E" Flag won in 1943 by RCA Laboratories at Princeton, N. J., Dr. C. B. Jolliffe, Vice President in Charge of the Laboratories, announced recently. The renewal is for a year instead of the usual six months.

In a letter of notification, Admiral C. C. Bloch, USN (Ret.), Chairman of the Navy Board for Production Awards, wrote:

"Each and every man and woman of the RCA Laboratories, Division of Radio Corporation of America at Princeton, is to be heartily congratulated for the splendid production record that has been established and maintained since the time that the original Army-Navy "E" was granted."



TRANSMITTER PANELS LINE BOTH SIDES OF THE CONTROL ROOM OF THE SHORT-WAVE PLANT AT DIXON, CALIFORNIA.

# DESTINATION: ORIENT

***Powerful Short-Wave Plant Built and Operated at Dixon, California, by RCA-NBC Engineers, Carries United Nations' Story to the Far East***



By Raymond Guy

*Radio Facilities Engineer*
*National Broadcasting Company*

ON a square mile of flatlands near the town of Dixon, 28 miles southwest of Sacramento, California, the combined efforts of radio engineers and construction experts have erected one of the world's most powerful short-wave voices, a modern Stentor now making itself heard in all parts of the Pacific and the Far East, and to the south and southeast in Latin America and South America.

The Dixon plant is a war-born infant with the vocal power of a giant. It was started soon after this country entered the war and was rushed to completion as part of a government project to extend the use of short-waves in carrying the story of the United Nations' ideals throughout the globe.

At the beginning of the war, when European developments had top priority, the first stations in the general plan were located in the East. Notable among these installations were the six powerful transmitters at Bound Brook, New Jersey, erected and operated by NBC for the Office of War Information and the Committee on Inter-American Affairs.

Once these facilities were under way, OWI contracted for additional outlets with greater power to perform similar functions in the Orient and Pacific areas and to the south. China, Russia, Japan, the mid-Pacific islands, Australia and New Zealand were the goals in one direction. The Spanish and Portugese speaking countries below the Mexican border and in South America were objectives in the reverse direction.

Accordingly, at the request of OWI, operating through the Defense Plants Corporation, the National Broadcasting Company and the Columbia Broadcasting System pooled their engineering resources in the design and installation of two complete transmitting plants at sites to be selected by the respective networks. Further to speed the work and thereby meet the increasingly urgent calls for the new services, it was decided that the two stations would be identical in architecture and equipment. It was also part of the agreement that NBC and CBS should operate the stations after their completion, with OWI supplying program material.

NBC's first move was to conduct searches to determine the most suitable location for the plant and the extensive array of directional antennas that would be needed for the specified global coverage. The Dixon acreage on level terrain, unobstructed for many miles in all directions, was found to meet all requirements.

### *Larger Unit Added Later*

The transmitter building at Dixon was laid out to accommodate one 200 k.w. and two 50 k.w. units, but for several months it operated with four 50 k.w. transmitters. The larger unit was put into action later as materials became available.

Built of reinforced concrete, the central structure has a floor area of more than 16,000 square feet, arranged in three sections: transmitter room, cooling room and administrative quarters.

In the main transmitter room, switchboard panels extend along both sides for a total length of 124 feet. The operator's console is placed at the far end, facing racks containing the audio-input amplifiers and test equipment. Behind each row of panels is a fireproof vault housing the power transformers.

Across one end of the building, a complete wing provides space for offices, store rooms, machine shops, laboratories and sleeping quarters for the staff.

The dual 50 k.w. units referred to, as well as the 50 k.w. driver on the 200 k.w. transmitter, were designed and built by the RCA Victor Division and are the type which has been installed at points all over the world in the prosecution of the war. Their design incorporates provisions for conveniently and quickly changing frequencies and for utilizing the type 880 tubes which are widely used in this type of equipment.

All transmitters utilize high level modulation. One modulator is connected to the 200 kilowatt transmitter. A separate modulator is connected to the two 50 kilowatt transmitters. The power supply for the 200 k.w. unit utilizes twelve 857-B tubes and the rectifier for the 50 k.w. units embodies an additional six 857-B tubes.

Many innovations were included in the design of the transmitters. Among the most interesting features are the tuning condensers mounted on motor driven carriages. When operations require a change in frequency, these condensers are moved on tracks beneath long copper pipes acting as part of the tuned circuits, until the proper point for resonance is reached. Movement of the carriages is controlled from the transmitter panel.

Adequate cooling of the huge tubes in the transmitters is a necessity. To take care of this item, an elaborate water circulating and rotating fan system is installed in the transmitter building. More than 10,000 gallons of cooling water flow through the transmitter tubes during each day's operations while a constant stream of cooled air supplied by large fans maintains an even temperature in each transmitter chamber.

Because of the high voltages involved, extreme precautions have been taken to protect the operating personnel from injury. Supplementing this protection are numerous devices to guard the apparatus against damage due to overloads or to failure of some major unit to function properly.

### *Lies on Great Circle Route*

By a fortunate circumstance, Dixon lies on the great circle route which passes through the Far East and down the Latin American peninsula into South America. Because of this, an antenna which beams a program westward from Dixon, can perform a similar service to the south of the United States merely by reversing its direction. If this seems to be a paradox to those familiar with the common maps of school geographies, its truth becomes apparent when the surface of the globe is reduced to azimuthal projection. Then only do the continents appear in their true, great circle relation.

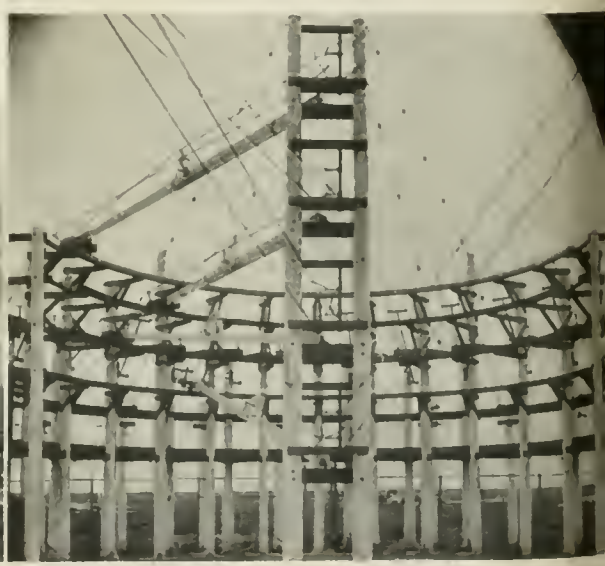
The antenna system comprises several groups of rhombics which are positioned to deliver the maximum signal strength to the selected sectors. Each group consists of several antennas designed for optimum efficiency on any one of three frequencies in the 6 to 21 megacycle region of the spectrum. The direction of any beam can be changed from the Far East to South America by means of a manually-operated switch located beneath each antenna.

As changes take place during the 24-hour day in the ionized layers far above the earth's surface, and as beam schedules change, it becomes necessary to shift from one frequency or antenna to another in order to obtain the best signal propagation. This adjustment is carried out at Dixon by means of an outdoor switching bay. Feed lines from each of the nine antennas are brought to the bay and attached to terminals arranged on the rims of three horizontal arcs, placed one above the other. Movable booms, connected with the transmitters through power lines, swing around the arc until contacts on the boom-ends coincide with the terminals of the antenna feedlines, thus completing the circuit.

From the transmitter building it is possible to see in the distance two separate mountain ranges. These peaks complicate the location of short-wave stations in the San Francisco area and dictated the location of this station 60 miles from that city. The directional antennas provide radio beams which are transmitted at very low angles above the earth, requiring that there be no mountain ranges within distances where they would intercept the beams.

BELOW: EXTERIOR OF DIXON, CALIF., SHORT-WAVE STATION. RIGHT: ANTENNAS ARE SELECTED IN THIS SWITCHING BAY.





# STORY OF A RADIO SCRIPT

*An Imaginary Drama, Submitted by a Free-Lance Writer, is Traced as It Moves Through the Customary NBC Routine.*



By Richard McDonagh

*Manager, Script Division, National Broadcasting Company*

RADIO broadcasting has a gargantuan appetite for scripts. It consumes literary material at a rate far in excess of any other entertainment medium. The layman who sits in front of his radio receiver listening to the uninterrupted flow of dramas, comedies, skits, talks and news reports may be impressed by the sustained quality of the programs that come to him without cost, hour after hour, day after day. But it is unlikely that he ever gives a moment's thought to the great bulk of manuscripts that must be conceived and produced in order that radio stations may supply a continuous schedule of programs for even a single 18-hour broadcasting day.

To explain what goes on behind the scenes, let us follow an imaginary script as it moves through the different steps that lead eventually to its actual production on the air. After we have done this and have been duly impressed, we could multiply the motions by one hundred and have a fair idea of the highly organized activities that go on constantly behind the doors of a network script department.

The script which we have chosen for this merry chase, is, let us say, the work of a free-lance writer. As such, it is only one of the hundreds of similar brain children mailed in to NBC each week.

When the script is taken from the envelope, a record of its receipt goes into the files, together with all known facts about its author. It then goes to the "Play Reading" division. Here, like all other program ideas that come in, it is read carefully by experienced play readers. If it is found unsuitable at this stage—unfortunately, this is the verdict in a majority of cases—it is returned to its owner. Where conditions warrant the special attention, a letter goes with the rejected script suggesting ways by which the material might be improved.

Occasionally, a script is received which bears the unmistakable mark of talent. The author's name and address are filed for future consideration when the services of a free-lance writer are needed for a special assignment.

### *Medium Should Be Studied*

Although authors have been warned repeatedly that the writing of radio scripts should not be attempted until a thorough study of the taboos, restrictions and styles of the medium has been made, writers continue to submit scripts which completely ignore this fundamental precept. Amateurish offerings make little impression on play-readers.

But when the unusual does occur—as happened to our imaginary script—and the literary work meets NBC's rigid requirements, the play-reader submits a detailed report on it. Script and report are placed on the desk of the Script Division Manager who, if he agrees with the favorable report, in turn submits it to the Production Division and to Program Management. Once our script has been accepted by these two additional groups it has started its routine. The next stop is in the "Literary Rights" section of the Script Division.

The primary purpose of "Literary Rights"—it has been called "the legal watchdog of NBC"—is to protect all literary rights owned by the network, and to guard the Company against the use of material that infringes on the copyrighted







THREE STEPS IN THE LIFE OF A RADIO SCRIPT. TOP TO BOTTOM: ASSISTANT SCRIPT MANAGER WADE ARNOLD WATCHES AS FREE-LANCE WRITER MORT GREEN SIGNS A "RELEASE FORM;" MANAGER MC DONAGH DISCUSSES THE SCRIPT WITH PLAY-READERS MARGO PHILLIPS AND ROBERTA BARRETT;; AUTHOR GREEN SIGNS AN NBC CONTRACT FOR THE PURCHASE OF HIS SCRIPT AS MARION NOYES (SEATED), LITERARY RIGHTS MANAGER, WITNESSES HIS SIGNATURE.

properties of others. But this little-known office has other important duties. Under the direction of the Script Division Manager, "Literary Rights" not only authorizes payment for accepted material but draws up a contract for the author to sign. The contract covers several items. It names the program on which the work will be used; it specifies whether or not NBC is purchasing all rights to the scripts, including movie and book rights, etc., and, in the case of serials, it lists the number of scripts to be purchased.

Our script, of course, must have a title. This means more work for "Literary Rights." Every title used on the air is checked carefully to be certain that it has not been used previously. A title may consist of only one word but generally, if someone already is using it, a new title must be chosen.

Now let us take a closer look at our mythical script. In several places, we find that the author has inserted quotations from other sources. These, too, must be investigated. "Literary Rights" acts at once to obtain the necessary authorizations from the original authors or the owners of the authors' rights. And finally, since this is to be an NBC production, the script must be copyrighted in its produced form. If its success on the air brings subsequent requests from other domestic or foreign stations for its broadcast use, it is the job of "Literary Rights" to attend to the details of leasing and payment.

### *Scripts Must Be in Good Taste*

Our hypothetical manuscript has cleared all hurdles so far and seems to be well on the way to its final objective — an actual broadcast from the studio. Up to this point, the text has been examined for literary form, writing skill and originality. Now it must stand trial for Good Taste and Public Policy. This "trial" takes place in still another section of the Script Division, labeled, on Company organization charts, "Policy Reading." If words of questionable meaning, or statements that might be objectionable to certain classes or groups, are found, they are singled out and brought to the attention of the Script Division Manager or his assistant, who arranges for the debatable material to be altered or deleted. This is done to safeguard the morals of the public and maintain the high standards associated with network broadcasting. This statement may sound stuffy but the precaution is extremely necessary.

At last, our perambulating manuscript, purged of its faults, protected as to its property value, clarified in its literary message and dressed up in a manner befitting its purpose, has completed its journey and is ready for production. The attention given it since its receipt may appear to be extreme but only by such treatment can NBC be assured that the material is suitable to be heard by every member of the audience family and acceptable to all races and creeds.

Our sample script, it will be remembered, was submitted by a free lance writer. A much greater volume of written texts reaches the Script Department from commercial clients and their agencies. These, also, are scrutinized in much the same manner and follow a somewhat similar routine. The principal difference lies in the handling of recommended changes. Since the client and agency have approved the script, courtesy demands that any alterations be approved by them.

But the same standards of good taste apply and only rarely—speaking in comparative terms, of course —is there a conflict on the propriety of material. The American sponsor, like the American network, realizes his great responsibility in providing millions of homes with programs that will entertain and inform without offense to any listener.

# RCA TO MAKE LINE OF RADIO BATTERIES

A FULL LINE of dry batteries, especially engineered for radio, will be added to the growing family of RCA products, beginning this month. In making the announcement, L. W. Teegarden, General Manager, RCA Victor Tube Division, said that initially, because of war demands, only a limited number of types will be made available through distributors but these types will account for 80 to 90 percent of the demand. As conditions permit, he added, the program will be expanded to include a full line.

Pointing out that radio batteries make up more than 60 percent of the total sales of the battery industry, Mr. Teegarden said that this is the first time a complete line of batteries will be offered by a radio manufacturer—one who knows radio and its requirements intimately from experience, and who is a leader in the manufacture of battery-radio sets.

Tests have proved that RCA batteries far exceed the minimum requirements of the U. S. Bureau of Standards, according to Mr. Teegarden, thus assuring maximum service and long life of operation in both portable and farm-type radios.

Application of "preferred-type" classifications, which have been used by RCA with outstanding success in the electron tube field, will make it possible, with relatively few types of batteries, to care for the bulk of all radio and general utility requirements. This, he pointed out, means smaller inventories and quick turnover for distributors and dealers, while for owners of battery-radio sets it will facilitate renewals.

The sale of RCA batteries will be handled by the Tube Division in conjunction with RCA tubes and parts. Sales to distributors will come under the supervision of David J. Finn, Manager, Renewal Sales Department.

An RCA replacement battery guide has been prepared covering all standard makes of radios, phonographs, and combinations, and a complete advertising and merchandising program has been organized to introduce the new line.



OFFICIALS OF RCA INTERNATIONAL DIVISION ENTERTAIN THREE MEMBERS OF THE NATIONAL RESOURCES COMMISSION FOR CHINA. LEFT TO RIGHT: LIEUT. COLONEL J. E. HORTON, RCA; T. ROBINSON COX, RCA; K. Y. YIN; J. A. BIGGS, RCA; W. K. CHOW; J. G. MACKENTY AND T. S. WANG.

# RADIO AIDS WORLD TRADE

*Faster Tempo of Global Business Expected to Call for Greater Use of Communications—American Firms Ready With New Products.*

By John G. MacKenty

*Managing Director*
*RCA International Division*

RADIO will play an active role in broadening world trade following the war. This will mean progress not only for the United States but for all the friendly nations which seek more security for their people by productive export-import business. As an implement of trade, point-to-point radio communication will help to quicken the pace of business and bring import buyer and export seller together more rapidly, thereby aiding many industries in their search for products, markets, or more efficient turnover.

Following the war, the pace of international trade will be stepped up considerably. The speed of radio communication itself will aid in this process along with another modern tool of overseas trade, faster transportation.

Particular industries, such as mining, petroleum, agriculture, as well as shipping and aviation, will expand their uses of radio in serving the two hemispheres and promoting the interflow of goods and services between them.

The battle for world trade will also involve world opinion; nations must and will be articulate. High power radio transmitters will help them to speak, via short wave and re-broadcast, to the rest of the world. Freedom of speech internationally, in the post-war period, will mean that nations will speak to each other, not only about their culture and their social and political problems, but also about their industries, their products, the inviting beauties of their countries.

### *Nations Must Use Radio*

During the war we learned a great deal about psychological warfare. A nation promoting its interests abroad must be prepared to make good use of radio broadcasting. World opinion is not formed exclusively by radio, but by its nature this medium matches the tempo of world affairs. "Getting there first with the most" is a fundamental precept of good radio technique.

Many nations will modernize their internal communication systems by means of new, high speed radio equipment. This will mean a speeding up of business generally. New developments in radio transmission will help not only isolated areas, but those which are more highly developed. Television, when available internationally, will be an important instrument in the exchange of products and services.

The radio industry in the United States is prepared to aid international trade in a broad sense. RCA, already well established overseas, recently announced the formation of the RCA International Division to administer the corporation's operations outside of the United States. With headquarters in New York, the new Division is responsible for the selling of all products manufactured by all of the various RCA companies. The hundreds of distributors of various RCA products long established within the activities of the RCA Victor Division will continue to function as an important asset of the RCA International Division. Under the new International Division will also be included the sales of the specialized ship-to-shore radio equipment manufactured by the Radiomarine Corporation of America, an RCA company, which formerly handled its own sales abroad.

## NBC 10-YEAR CLUB

Induction of 36 employees into the NBC 10-Year Club at the organization's annual dinner held May 3 at the Waldorf-Astoria Hotel, increased the membership to 629. Speakers at the dinner included Brigadier General David Sarnoff, President of RCA and Chairman of the Board of NBC; Niles Trammell, President of NBC, and Clay Morgan, assistant to Trammell. Dr. James R. Angell, NBC Public Service Counselor, was toastmaster.

# NEW SHIPBOARD RADIO SET

*16-Tube Receiver, Designed by RCAC to Provide Entertainment for Crew, Can Be Used Without Betraying Ship's Position.*



By I. F. Byrnes

*Chief Engineer,*
*Radiomarine Corporation of America*

IN connection with the large wartime shipbuilding program of the U. S. Maritime Commission, one of the factors which has received careful attention has been adequate provision for the reception of broadcast programs. Shipboard personnel, by the nature of their duties, must spend long periods of time isolated from events on land. In wartime, with its attendant maritime hazards, the absence of news and entertainment would put an additional strain on the men who "go down to the sea in ships." Therefore, an efficient broadcast receiver capable of receiving the standard broadcast band, as well as the short wave bands, is an essential part of the radio equipment on our modern wartime merchant fleet.

Prior to the war many members of the crew, wishing to tune in their favorite programs while at sea, would bring aboard their own broadcast receivers. The conventional superheterodyne type of radio receiver, which includes an oscillator, is capable of radiating a signal that might be picked up over distances of several miles. With the submarine menace, the use of such receivers would endanger the safety of the ship and crew because the radiated signal would disclose the ship's position. Accordingly, it was necessary to prohibit the use of any type of receiving equipment aboard ship unless that equipment complied with rigorous specifications which limit the radiated power to an extremely small value. Just how minute this value of power is may be visualized by stating that it would require the combined output of two and one-half billion receivers to equal one watt.

### *New Receiver is Versatile*

Engineers of Radiomarine, using their long experience in the design and development of communication equipment for shipboard service, have developed a new model AR-8511 receiver to meet the specifications of the U. S. Maritime Commission. In the design of the new unit particular attention was directed toward achieving highly reliable equipment, simple in operation, and capable of being powered directly from a source of 115 volts D.C. The large majority of merchant ships have a primary power supply which is direct current. Therefore, the use of a basic A.C. type of receiver would involve additional power converting apparatus, such as a motor generator or vibrator. Since a shipboard broadcast receiver may be used twenty-four hours a day, it is highly desirable to eliminate completely all power converting accessories which are subject to considerable wear and tear.

The new receiver is constructed in an aluminum cabinet, provided with built-in rubber shock-mounts to protect the equipment from the effects of shipboard vibration. A cast aluminum chassis is employed to insure maximum rigidity of all components. Convenient access for tube replacements or routine maintenance is obtained through a hinged top cover. The receiver front panel and the chassis are assembled as a unit for easy removal from the cabinet.

Four tuning ranges chosen by means of a band selector switch permit coverage of the standard broadcast band of 530 to 1600 kilocycles, as well as all short wave channels between 5 and 23 megacycles. The tuning scale is of the full vision type and is constructed of Lucite with indirect illumination for use in a darkened pilot house or chart room.

### *Selectivity May Be Varied*

A feature, not ordinarily found in a broadcast receiver, is the control of selectivity characteristics. This is accomplished by means of a three-position selectivity control which changes the intermediate frequency amplifier circuits for



STURDY, COMPACT AND EFFICIENT, THIS NEW RADIOMARINE RECEIVER WAS DESIGNED TO PROVIDE ENTERTAINMENT FOR CREWS ABOARD SHIP.

"sharp", "medium" or "broad" band-pass conditions. In the "broad" position, the receiver circuits will pass audio frequencies from 50 cycles to 8,000 cycles, thereby enabling reception of high fidelity programs. In the event of excessive atmospheric noise or interference, the selectivity control is used in the "sharp" or "medium" positions. The receiver is also fitted with a fidelity or tone control so that the higher audio frequencies may be attenuated when desired.

### *Receiver Has 16 Tubes*

Sixteen vacuum tubes are used in the AR-8511. The circuits comprise one stage of radio frequency amplification, three stages of intermediate frequency amplification, and the usual mixer, high frequency oscillator, second detector, phase inverter and audio amplifier stages. The second detector is arranged so that it also functions as a noise limiter which may be switched in or out of circuit by means of a panel control. In addition, a C.W. (continuous wave) oscillator stage is provided so that the receiver may be used as a communications unit for reception of telegraph signals. Facilities are also provided for connection to an electric phonograph pickup.

The average shipboard installation, using a broadcast receiver of this type, includes four or five 12-inch loud speakers located throughout the vessel. The receiver itself is located in the chart room or pilot house, and has connected to it a 6-inch monitoring loud speaker. Such an arrangement requires that the receiver be capable of delivering considerable power to the loud speaker system. The AR-8511 is designed to provide 10 watts of audio power with a harmonic distortion not exceeding approximately six percent. An output of 13 watts is possible before the distortion exceeds ten percent.

The low radiation characteristic of the receiver is accomplished by means of careful filtering, isolation, and shielding of the oscillator circuits. Furthermore, the use of a comparatively high intermediate frequency, 1700 kilocycles, provides additional discrimination between the tuned R. F. amplifier and the oscillator stages. The use of 1700 K.C. as the intermediate frequency also enables a high image-rejection ratio to be maintained. These ratios are in the order of 5,000 for the broadcast band and 1,000 for the band between 10 and 15 megacycles.

### *Adapted for Different Antennas*

The receiver is designed for use with either a doublet type of antenna or the conventional single wire. The sensitivity is such that signals to the order of 10 or 15 microvolts per meter may be used on the basis of a signal-to-noise ratio of one hundred-to-one. The automatic volume control circuits hold the output substantially constant with inputs of 100 microvolts to 1 volt.

In addition to the normal application of the AR-8511 for reception of broadcast programs, the unit is also well suited for service as a communications receiver. A panel controlled C.W. oscillator permits reception of continuous wave telegraph signals, and the coverage of the short wave bands from 5 to 23 megacycles includes all of the channels normally used for long distance code communication. The receiver panel is provided with a phone jack so that telephone receivers may be used for this service.

### *Special Rectifier for A. C.*

As previously mentioned, the receiver is designed for operation from a direct current source of 115 volts D.C. For installation at shore locations or other points where the power supply is alternating current, a compact rectifier unit is used. This rectifier unit delivers 40 watts at 115 volts D.C. for the plate and screen circuits of the receiver.

In the overall design of the AR-8511, advantage has been taken of many improved electrical components developed during the war. Ceramic tube sockets are used throughout to maintain high insulation under marine moisture conditions. All coils are thoroughly wax impregnated to resist moisture. American War Standard capacitors, resistors, and other components are employed. Ceramic type trimmer capacitors which maintain their adjustments under severe operating conditions are utilized in the R.F. circuits. Adjustable iron cores for the R.F. inductors are provided. The use of aluminum for the cabinet, panel, and chassis reduces overall weight.

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## RCA TERMINATES V-LOAN CREDIT

### Company Repays Balance Due On $75,000,000 Advance.

Through repayment on May 7, 1945, of $35,000,000, the Radio Corporation of America terminated the $75,000,000 V-Loan credit which it made in September 1942 with thirty-five banks and trust companies, Brigadier General David Sarnoff, President of RCA, announced May 8.

The Corporation originally borrowed the full amount of the V-Loan Credit and gradually repaid $40,000,000. The final repayment leaves the Corporation with no loans or fixed indebtedness outstanding.

RCA was one of the first corporations to arrange for a V-Loan Credit under regulations issued by the Board of Governors of the Federal Reserve System to facilitate and expedite war production. At that time, it was the largest loan of its kind to be made.

## RCA Declares Dividend

Following the meeting of the Board of Directors of the Radio Corporation of America, held June 1, in New York, Brig. General David Sarnoff, President, announced the declaration of a dividend of 87½ cents per share on the outstanding shares of $3.50 Cumulative First Preferred stock, for the period from April 1, 1945, to June 30, 1945. The dividend was made payable July 2, 1945, to holders of record at the close of business June 11, 1945.

# RCA VICTOR TRAINS SALESMEN

*New Course is Laid Out to Give Field Force a Basic Understanding of Company Products, Policies and Markets.*

By W. Boyce Dominick

*Personnel Administration, RCA Victor Division, Camden, N. J.*

TO prepare sales representatives to meet the keen competition which will be encountered in the postwar market, RCA Victor has developed a new basic training course designed to give its field force a comprehensive understanding of the RCA organization, its policies, background, markets, products, and postwar plans. It is believed that by giving sales representatives a broad, well-rounded picture of their Company they will be in a better position to present to the best advantage the specific lines manufactured or sold by RCA Victor and to build goodwill for the Company.

The new training course was developed by a special Sales Training Committee appointed by the General Managers of RCA Victor. With the writer serving as chairman, the committee members were George R. Ewald, A. Goodman, J. L. Hallstrom, E. T. Jones, E. N. Madden, C. G. O'Neill, and T. A. Smith, Secretary.

### *Students Suggest Agenda*

The committee's first step was to address a questionnaire to RCA Victor sales representatives to secure their help in developing a basic training course which would meet the specific needs of the field force. Representatives who had been active for some time were asked to enumerate the subjects they themselves would like to have presented in a "refresher" course. They were also requested to suggest, on the basis of their own sales experience, the type of training they felt would be helpful to newly-appointed field representatives.

The response to this questionnaire was almost 100%, a fact which strikingly illustrated the general desire of sales representatives for such a program. Many of those queried offered valuable suggestions for the development of the new course. Commercial managers and Regional managers were also asked for their suggestions as to the material to be incorporated in the basic training course. It was interesting to note that their recommendations coincided with those made by sales representatives themselves.

Among the leading subjects on which these men wanted information were competition, service policies, sales techniques, customers' problems, markets, and electronics; specifically, they wanted product information which would help them to sell RCA products in a highly competitive postwar market.

### *Plan Has Two Objectives*

On the basis of the returned questionnaires, a careful overall study was made of the training requirements of the field force, both from the standpoint of the representatives themselves and their commercial departments. A tentative plan was evolved by the Sales Training Committee and objectives of the proposed training were crystallized into two major phases:

1. To present an over-all picture of RCA, its products, markets, merchandising policies, methods of distribution, competition, conditions of sales, and customer problems, so that each RCA sales representative would be equipped with the basic information needed to perform an intelligent sales job in a highly competitive market.

2. To further develop the attitudes and morale of RCA sales representatives through acquaintanceship with the executives of the Company and their plans, and the progress that is being made, through research, on established products and new products.

The training course subsequently developed was skillfully prepared and directed to cover a broad range of subjects in an original and stimulating program. Several months ago the first group of forty sales representatives were brought together in Philadelphia for the program. Five and a half days were devoted to the course, including three evening sessions. These meetings were addressed by executives of the Company, sales specialists, engineers, and other members of RCA.

One of the highlights of the program was a panel discussion held on the concluding day when questions accumulated during the sessions were submitted by sales representatives and answered by a panel composed of J. K. West, Chairman, H. P. Alspaugh, Meade Brunet, Edward C. Cahill, W. L. Jones, Allan B. Mills, J. W. Murray, Robert Shannon, and L. W. Teegarden. Many leading questions based on products, markets, and merchandising policies for the postwar period were clarified through this panel discussion so that each representative was given a direct answer to his specific question. The panel discussion proved so lively that a number of those present declared they had gained a fresh concept of the Company and its postwar possibilities. Another highlight of the course was a visit to the RCA Laboratories at Princeton.

### *Visual Aids Widely Used*

Throughout the training program the various commercial departments made generous use of charts, slides, and sound motion pictures in connection with their presentation. At the conclusion of the presentation by each department, a question and answer period was held.

Product booklets, sales promotional literature, books on electronics, and helpful material on selling and salesmanship were made available to sales representatives. A bibliography of reference works on advertising, selling, and marketing was provided as a part of the printed program for the week.

Voluminous notes taken during the course by the forty sales representatives in attendance were evidence of the keen interest aroused by the presentations. Personal in-










FORTY RCA VICTOR SALES REPRESENTATIVES PARTICIPATE IN A NEW COURSE OF LECTURES AND INSPECTION TRIPS TO ACQUAINT THEM WITH THE COMPANY'S POLICIES, PRODUCTS AND POST-WAR PLANS. TOP RIGHT—FRANK M. FOLSOM, EXECUTIVE VICE PRESIDENT IN CHARGE OF RCA VICTOR DIVISION, ADDRESSES ONE GROUP OF SALESMEN. LOWER RIGHT—C. N. HOYLER OF RCA LABORATORIES EXPLAINS THE ALL-ELECTRONIC PENICILLIN PROCESS TO ANOTHER GROUP.

terviews with a cross section of the sales representatives and questionnaires addressed to all of them at the conclusion of the course showed that the following values were obtained from the project:

a. A good understanding of the background, products, merchandising policies, and methods of distribution of the RCA Victor Division;

b. An appreciation of the thought and effort that have been put into postwar planning on the part of company executives; and

c. A new concept of the progressive spirit exhibited by the Company in its research activities.

### *Course to be Extended*

Substantially the same course was later presented to a second group of sales representatives in Philadelphia. Plans are now projected for making such basic training available to additional groups of sales representatives as soon as transportation restrictions are lifted.

This "refresher" course, designed to give a clearer inside picture of the Company than has been presented heretofore to the sales force, is considered only a good beginning in any well-organized sales training program. It was not designed to take the place of sales product training or training in sales techniques, which of necessity constitute a continuous company activity. It does, however, answer the desire of sales representatives for foundational information on the Company they will represent and the products they will sell in a highly-competitive postwar market.

During the preparation of the course, one sales representative expressed his conviction that "the specialized sales representative should have concentrated training in the products he sells and a good working knowledge of other products and the Company's policies, so he will not appear ignorant of other activities of the Company."

During the course one of the speakers brought out this same thought. He said, "It is not enough merely to do our own jobs well. We shall in effect be doing those jobs better than they have ever been done before if we do them with a better understanding of all our interdependent relationships."

### *Reasons for Course*

It was to meet this need for a basic understanding of the Company as a whole that this course was developed and put into successful operation for the "refreshing" of established representatives and the orienting of newcomers to the RCA selling organization.

Since the course was developed, a Sales Training Program has been built for each new Sales representative on an individual basis. The procedure is to schedule interviews for the Sales representative with specialists in the Company so that the new representative may receive as much as possible of the information provided in the Sales Training Course.

## SARNOFF ANNOUNCES RCA SCHOLARSHIPS

A scholarship plan for the encouragement of promising young scientific students has been adopted by the Radio Corporation of America, Brigadier General David Sarnoff, President of RCA, announced on July 9.

Under the plan, approved by the RCA Board of Directors, as many as ten students may receive RCA scholarships during the academic year 1945-1946, thirty during 1946-1947, fifty during 1947-1948, and sixty each academic year thereafter. Each scholarship consists of a cash award of $600. Those eligible will include all students enrolled at universities to be specified later by the RCA Education Committee. Selection will be made upon recommendation of the dean of the specified university and approval by the committee.

Comprising the RCA Education Committee are Dr. James Rowland Angell, Public Service Counselor of the National Broadcasting Company, who is Chairman; Gano Dunn, a Director of RCA; Dr. C. B. Jolliffe, Vice President in Charge of RCA Laboratories, and F. H. Kirkpatrick, Director of Education and Training, RCA Victor Division.






RCA STOCKHOLDERS CROWD STUDIO 6A IN RADIO CITY TO HEAR THE 26TH ANNUAL REPORT BY BRIGADIER GENERAL DAVID SARNOFF, PRESIDENT (INSET ABOVE). DIRECTORS OF THE COMPANY ARE SEATED AT THE LONG TABLE ON EITHER SIDE OF PRESIDENT SARNOFF.

# RCA STOCKHOLDERS MEET

*New Peaks of Productivity and Service Reached by Company, Sarnoff Reports—Preliminary Steps for Reconversion Outlined.*

WITH all of its facilities contributing to the supreme task of helping to win the war, the Radio Corporation of America, during the past year, reached new peaks of productivity and service in every phase of its operations, Brigadier General David Sarnoff, President, announced May 1, at the 26th Annual Meeting of RCA stockholders in an NBC studio in New York. He declared also that all divisions of the company have made plans and are taking preliminary steps to resume peacetime activities and development as soon as conditions permit. The company's present working capital of approximately $60,000,000, General Sarnoff added, should be sufficient for reconstruction and expansion in the postwar period without necessitating the raising of additional capital through long-term borrowing.

In reporting operations in the first quarter of 1945, General Sarnoff revealed a gross income of $85,385,000, an increase of 8% over the corresponding period of 1944. Net profit after taxes was $2,987,000, an increase of 24% over the first quarter of the previous year. Earnings per common share after taxes increased from 11.6 cents per share to 15.8 cents for the quarter. Federal income taxes amounted to $9,157,000, an increase of 14% over the first quarter of 1944.

### *Unfilled Orders Decrease*

Unfilled orders of RCA manufacturing plants on April 1, 1945, totalled approximately $180,000,000 compared with $300,000,000 on the same date a year ago, a decrease of about 40%. Orders booked during the first quarter of this year amounted to $62,000,000 compared with $83,000,000 for the same period in 1944, a decrease of 25%.

After recalling that RCA personnel had increased from 457 in 1919, when the company was founded, to 38,000 today, General Sarnoff outlined the pension plan adopted on December 1, 1944 for the employees of the Corporation and its subsidiaries. The plan, approved by stockholders at the May 1 meeting, is open to all employees and assures them the security of an income upon retiring. "Stockholders," General Sarnoff said, "benefit from a Retirement Plan, for it offers encouragement to younger men to remain in the service of the company during their most effective years and attracts others to enter its service. Systematic retirements keep the ranks younger and the lines of promotion open. Thus the interests of the company and its stockholders are promoted by maintaining vigorous, competent personnel and by a higher morale throughout the organization. Maximum efficiency, loyalty and enthusiasm are stimulated. These are factors upon which the future of the company depends."

General Sarnoff told the stockholders that more than 90% of the employees eligible to participate have enrolled in the Plan and that 98% of the voting stockholders had approved the Plan.

### *All-Time Gross Profit is 9%*

During the first 25 years of the company's existence—from 1919 to the end of 1944—RCA's profits, before Federal Income Taxes, totalled $237,000,000. This, General Sarnoff said, represents a profit of 9% on the gross business. Federal Income Taxes amounted to $114,000,000, leaving a net profit of $123,000,000, an average net profit over the 25 year period of nearly 5%, after taxes.

"During the first year of the company's operation," General Sarnoff stated, "the gross business was

only $2,000,000. The growth and scope of our activities—particularly during the war period—are indicated by the fact that last year our business was more than $326,000,000.

"Out of earnings during its first 25 years, RCA paid approximately 65% or $80,000,000 in cash dividends; $57,800,000 was paid on the Preferred stock and $22,200,000 on the Common stock."

### *Predicts Record NBC Year*

Analyzing the activities of each Division of the Company in 1944 and prospects for the current year, General Sarnoff said that the report of business done by the National Broadcasting Company in the first quarter of 1945 "gives evidence that this will be another record year for the National Broadcasting Company. NBC's volume of business in 1944 exceeded that of any previous year.

"During the past year," he continued, "the world-wide circuits of RCA Communications continued to perform outstanding service in linking the battlefronts as well as the United Nations. Evidence of the tremendous activity on the international wave-lengths is found in the record of 150,000,000 words, largely related to the war, handled by RCA in 1944. It is expected that the 1945 total will exceed 200,000,000 words.

"The war likewise puts increased demands upon radio on the high seas. To serve this greatly increased maritime activity, the Radiomarine Corporation of America has developed and produced radio apparatus of highest efficiency. Hundreds of U. S. Navy vessels and ships of the Merchant Marine carry this latest equipment, including automatic lifeboat radios and direction finders."

### *100 War Projects Conducted*

The Laboratories, he said, have conducted more than 100 war projects for the Army, Navy and the Office of Scientific Research and Development. RCA scientists have pioneered in laying the groundwork for network television, facsimile transmission and many other services. Included in this development work is the practical use of microwaves in the radio relay. General Sarnoff revealed that RCA in the near future expects to have in operation a radio relay chain between New York and Washington. Applications for this system have been filed with the Federal Communications Commission. It will provide a large number of channels capable of handling international communications traffic, radiophotos and program transmission.

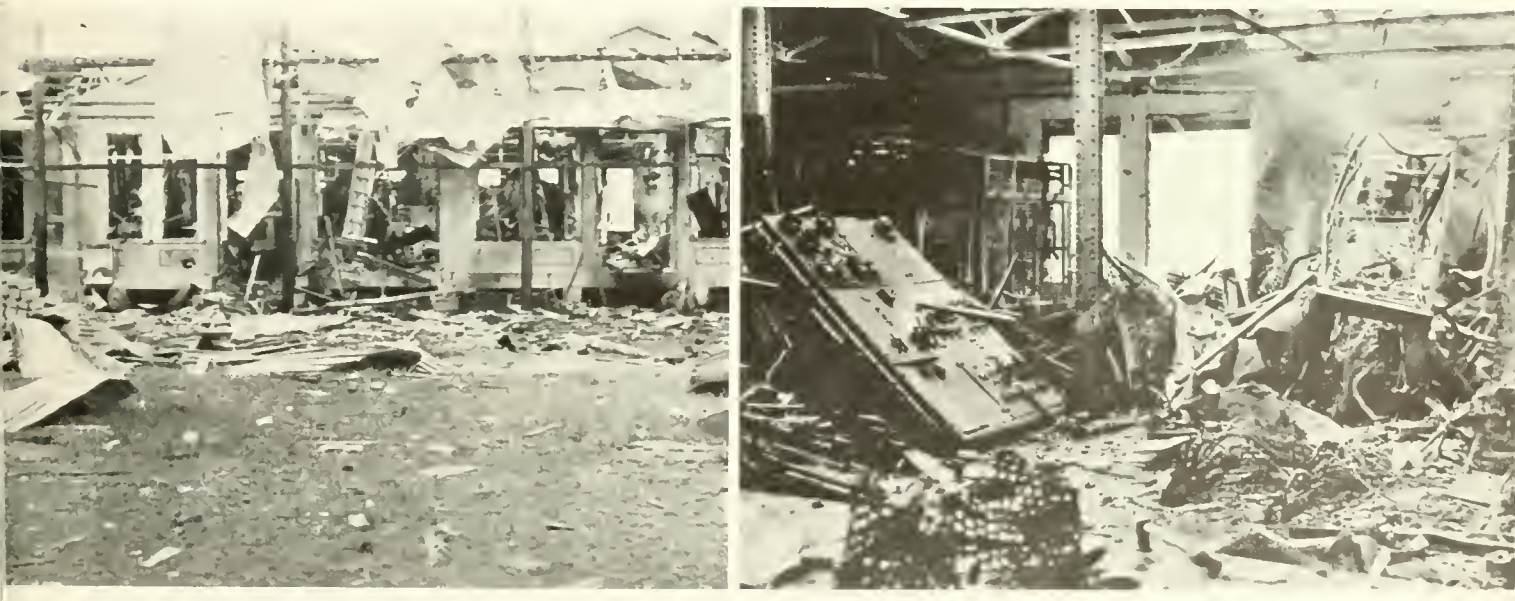
### *Over 200 New Tubes Built*

Other outstanding wartime accomplishments of the Company, General Sarnoff related, have been the building of more than 200 new types of electron tubes; the greatly extended application of radio heat in industry, and an advanced development model of projection type television receiver with a picture image 16 by 21 inches.

"In the swiftly moving art that is radio," RCA's President concluded, "our direction must be constantly forward. Television holds great promise but it is not the only promise for the future. Every new development of radio and electronics is a new opportunity for increased service to the public, for more employment in the industry and for greater prospects for the company and its stockholders. We will pursue these opportunities to the utmost of our abilities."

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# Manila Installations Razed to Foil Japanese Invaders



SCENES OF DESTRUCTION AT THE MANILA STATION OF THE RADIO CORPORATION OF AMERICA AFTER THE TRANSMITTER, ANTENNAS AND POWER SUPPLIES HAD BEEN DEMOLISHED IN JANUARY, 1942, TO PREVENT THEIR USE BY THE JAPANESE. FOLLOWING RECONSTRUCTION OF ALL FACILITIES, RCA COMMUNICATIONS RESUMED TRANSMISSIONS FROM THIS COUNTRY TO THE PHILIPPINES ON JUNE 17.

# Fungus Fighters

## CHEMISTS AT RCA VICTOR DEVISE PROTECTIVE MEASURES FOR RADIO EQUIPMENT DESTINED FOR THE MOISTURE-LADEN TROPICS

By Clifford Eddison

*Manager, Chemical Engineering Section*
*RCA Victor Division*

THAT an ounce of prevention is worth a pound of cure is dramatically represented by the "tropicalization" of electronic equipment, where it has been demonstrated that the treatment may extend the useful life of equipment as much as 240 times when exposed to severe atmospheric conditions. The history of "tropicalization" as applied to our equipment is another development created by the exigencies of war.

Any and all equipment for military service in a global war must operate under any condition to be found on the surface of the earth and, in some cases, under the seas and in the air. This is particularly true of electronic equipment. Communications (radio, radar, etc.) must not be impeded. It is more vital than the missing nail from the shoe of the horse, for lack of which a battle was lost.

In normal times, most commercial radio equipment manufactured in the United States was built for the domestic market and usually housed in atmospheres largely independent of external climatic conditions. The materials of construction were sufficiently satisfactory to ensure a long and useful operating life. Reports of material failure, because of exposure to unusual and much more drastic climatic variations, such as high temperature and excessive humidity, had been received from the South American and Caribbean areas, but the number of equipments involved was very small in relation to total production, and remedies for the situation proceeded somewhat slowly.

### *High Humidity is Common*

The full impact of the significance of this kind of exposure on military materiel was not wholly realized until the equipment was operated in the early stages of the war in the South Pacific—in tropical regions such as New Guinea, Borneo, the Solomon Islands, Java, etc.—where the temperature is usually high and the humidity is close to, or at, the saturation point at all times, and where even a slight depression in temperature results in dew point (condensation). When, to these conditions, are added tropical rain storms, swamps, and water drained or trapped in foxholes, it can readily be seen that equipment operated in such environment rarely has the chance to dry out completely, and that the rate of attack on materials is accelerated with consequent early failure of equipment.

The solution to the problem comprised a number of phases:

(a) Redesign of component parts and equipment in order to eliminate water traps and conditions conducive to fungus growth.

(b) Immediate substitution of materials of reduced sensitivity for materials known to be sensitive to moisture absorption or fungus growth.

(c) Provision of a water-resistant, fungus-proof coating for component parts and equipment.

(d) Determination, by thorough study, of the best materials for use in electronic equipment and the optimum method of processing them in order that equipment might operate under any observed or anticipated conditions of use.

Steps (a), (b) and (c) were put into operation as quickly as possible and together formed the basis of what has come to be known as "Tropicalization."

Since fungi cannot propagate in the dry state, the problem of protecting materials from them, with consequent increased life for equipment, would seem to resolve itself into complete water-proofing of component parts and completed equipment. While water-proofing does go a long way towards solving the problem, it cannot be considered a completely satisfactory one, since











LEFT: A SPRAY OF LACQUER IS THE FIRST STEP IN PREPARING A RADIO CHASSIS FOR ITS DESTINATION IN THE TROPICS. BELOW, LEFT TO RIGHT: 1—ALL AIR IS REMOVED BY SUCTION FROM THE WATER-PROOF BAG CONTAINING THE EQUIPMENT; 2—THE PAPER ENVELOPE IS SEALED; 3—A SECOND CARTON IS PLACED

it is difficult to conceive of all water-proofed materials in humid atmospheres being free of surface moisture. In the presence of this surface moisture and nutrient media, the latter provided by natural sources (sand, humus, finely divided soil) and carried by the wind, fungus may develop.

A number of materials were examined to determine their usefulness as water-proofing agents, but many, otherwise suitable, had physical or chemical limitations with respect to other necessary characteristics for communications equipment, making them of small value for the purpose. Many materials having efficient water-proofing properties do not meet all other expected requirements. Some of them, for example, may have too low a softening point. Others crack at low temperatures. Airplanes, though stationed in the tropics, must often fly at extremely high altitudes, which means, of course, exposure to low temperatures. Cracks formed at the low temperatures permit diffusion of moisture to component parts once the plane has returned to the tropical conditions prevailing at its base, with consequent early failure of the parts. Much experimental work had to be done by the services, notably the Signal Corps, and industry before a workable solution to the problem was available. Component parts and equipment are now treated, either by spraying, dipping or brushing with a lacquer or varnish having high moisture resistance as well as other desirable properties and in which fungicidal agents have been incorporated.

A fungicidal agent may be described briefly as an agent restricting the growth of fungus. To be a little more technical, perhaps, it must have fungistatic properties. The evaluation of fungicidal agents brought into communications equipment manufacture an activity and techniques alien to commercial radio manufacture. One of the first steps in this evaluation is the development of proper techniques controlling the growth of fungus.

### *Nature Develops Fungus Easily*

Under tropical conditions of high temperature and humidity( it is not essential to travel to the South Pacific to obtain them—some conditions of storage and packaging simulate them quite well in Boston, Chicago or Washington) nature seems to have no difficulty in developing prolific fungus growth. Nutrient elements, independent of natural sources, are found in many organic construction materials, including those finding use in communication equipment (cotton, paper, wood, some adhesives, felt, leather, etc.), either because of their inherent chemical composition or because, in prior manufacturing processes, chemicals supporting fungus growth may have been used and retained by fibers or cells. In the laboratory, however, exquisite care must be taken with respect to prior sterility, to the kind and amount of nutrient media employed, and to temperature and humidity controls, before specified types of fungus may be grown.

In practice, various kinds of fungi are used for testing purposes, four of the most widely employed species being Aspergillus Niger, Aspergillus Flavus, Penicillium Luteum and Trichoderma T1 USDA. These different species of fungi are used for a number of reasons. In the first instance, amongst them are species most destructive of cellulosic construction materials. In the second instance, under controlled laboratory conditions, they are not the most difficult fungi to grow; and, finally, the fungistatic properties of different fungicidal agents may be more thoroughly determined by using all of them than by testing these preparations against one type of fungus, since all fungi do not react the same way to the same fungicidal agent. Collectively, they present a fairly good yardstick by which the fungistatic properties of all the more common fungicidal agents can be measured. Some of these agents, selected from a long list available for the purpose, are: salicylanilid, copper naphthanate, parabromorthocresol, parachloro-metacresol, anilinomethylbenzomercaptothiazole, phenylmercuric stearate and tetra and penta chlorphenol.

The fungistatic properties of fungicidal agents depend not only on their chemical structure, but also on certain physical properties of which the vapor pressure developed over a useful temperature range is important. Too high a vapor pressure between 30° and 80°C, for example, is not desirable, since the compound may volatilize in too short a period of time. On the other hand, a vapor pressure below a definite value would not give fungistatic protection.

Other considerations involved in



HOWEVER SMALL THE RADIO PARTS TO BE SHIPPED, THEY RECEIVE THOROUGH PROTECTION AGAINST MOISTURE-VAPOR THROUGH THE USE OF SPECIAL SEALING ADHESIVES AND CAREFUL PACKAGING.

OVER THE FIRST; 4—OVER ALL GOES A SECOND WATER-PROOF ENVELOPE, AND 5—THE COMPLETE PACKAGE, NOW MULTI-PROOFED AGAINST THE RUINOUS EFFECTS OF TROPICAL FUNGUS AND CONTINUOUSLY HIGH HUMIDITY, IS PLACED IN A CRATE FOR SHIPMENT TO SOME DISTANT WAR FRONT.






selecting a suitable fungicidal agent include the solubility of the compound in lacquer or varnish solvents and its compatibility with the dried lacquer or varnish film. It is essential that the fungicidal agent stay in solid solution with the dried film. Separation, particularly at the surface, would not only deprive the full thickness of the film of the protection offered by the fungicidal agent, but, in the case of some such compounds, would present a physiological hazard, since many of them are of a toxic nature and may cause dermatitis.

### *Fungicides are Watched*

Another factor involved in the selection of a fungicidal agent, apart from any question of fungicidal activity, is its effect on other materials employed in component parts manufacture or equipment assembly. Some fungicidal agents liberate products capable of attacking certain materials and causing corrosion—a possibility which cannot be tolerated in electronic equipment.

An interesting activity contributing to the success of the "tropicalization" program is the care with which assemblies and parts are packaged for shipment overseas. Materials and processes for packaging have been scientifically selected in order to restrict the access of moisture vapor to the contents of the package when in transit or storage, or, in case of accident or necessity, (sometimes a ship's cargo must be floated to shore on the tide) to prevent the ingress of water.

While, obviously, dissimilarity in type, mass and shape of various materials prohibits entirely uniform packaging procedures, one method pertinent to the shipping of electronic parts and equipment designed to restrict the entrance of moisture vapor may be described as the carton-barrier-carton system. Much of the effectiveness of the system may be credited to the construction and materials of the barrier. The kind used in the RCA Victor organization relies essentially for its moisture-vapor-proofing properties on a thin metal foil of aluminum or lead. The metal foil is backed by a special paper which in turn is backed by a textile known in the trade as scrim cloth. Foil, paper and textile are joined together by water-proof adhesives in a continuous operation. The surface of the metal foil is then coated with a special thermoplastic adhesive selected for its ability to seal perfectly to itself on the application of heat. Envelopes of required size are fabricated from this laminated structure.

In practice, the article to be packaged is placed in a carton of specified paper or cardboard. A suitable amount of moisture absorptive material, such as silica gel, contained in a cotton bag, is introduced. The carton is then placed in one of the moisture-vapor-proof envelopes and the top of the envelope is sealed by means of locally applied heat.

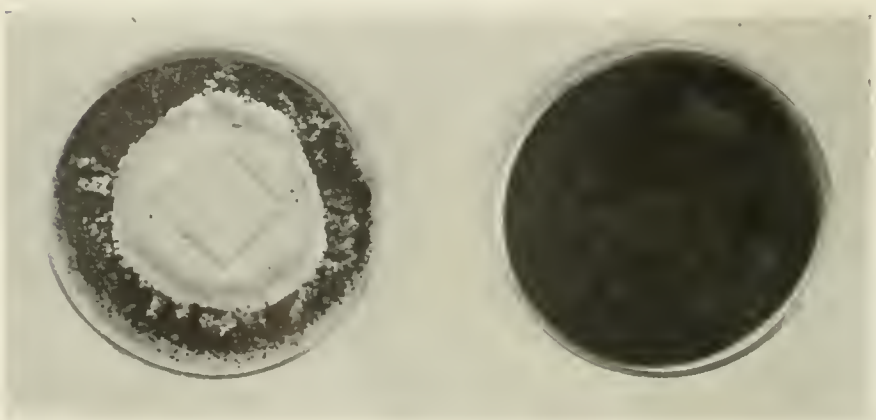
An interesting innovation during the sealing operation is the withdrawal of as much air as possible by means of a suction system similar to an ordinary household vacuum cleaner. This withdrawal of air deflates the envelope, and makes the structure conform easily to the next operation, namely, insertion into another carton of approved paper or cardboard. When this carton is sealed with a water-proof adhesive the process of moisture-vapor-proofing is completed. The value of the method, of course, relies on the inability of moisture vapor to pass through the metal foil. However, it is not entirely impermeable to moisture over long periods of time. Pinholes in the foil may exist and moisture is present in the residual air of the envelope at the time of sealing. The amount of silica gel to take care of these considerations is calculated in advance, based on the size of the package and its probable time in transit and storage.

### *Water-Proof Barrier Added*

Water-proofing, as distinct from moisture-vapor-proofing, is provided by a water-proof barrier, usually in the form of a bag, made of a laminate of paper and an asphaltic material. Sometimes two, sometimes three layers of special Kraft paper are used. To resist mechanical shock, the completed package is held in a wooden case.

The guarding of parts and equipment by "tropicalization" against the effects of adverse atmospheric conditions, from the time of manufacture and assembly through shipping and storage to a useful life wherever operated has become a complete and accepted function—an integral part of RCA Victor manufacturing practice and thoroughness.

DESTRUCTIVE FUNGUS HAS BEEN UNABLE TO DEVELOP ON THE SMALL SQUARE OF TREATED LAMINATED BOARD AT THE LEFT BUT HAS COMPLETELY COVERED THE UNTREATED SURFACE ON THE RIGHT.









CROWDS WAIT TO ENTER THE GATES OF RCA'S LANCASTER, PA., PLANT DURING THE OPENING DAY OF ITS "OPEN HOUSE," JUNE 11-13. AT RIGHT: VISITORS SEE EXHIBITS OF THE LATEST RCA CATHODE-RAY TUBES AND LISTEN TO EXPLANATIONS OF THEIR USES IN TELEVISION APPARATUS AND INDUSTRIAL PLANTS.

# "OPEN HOUSE" AT LANCASTER

*Thousands Accept Invitation of RCA and Navy to Inspect Tube-Making Plant Closed to Public Since Its Erection.*

THE community of Lancaster, Pa., turned out to salute the wartime achievements of the 2½-year-old RCA plant in that city on June 11, 12, and 13, when RCA, in cooperation with the United States Navy, held "Open House" at which visitors were admitted to the plant for the first time.

Tube manufacturing and testing operations in the sparkling work areas of the plant, which is the most modern electron-tube-manufacturing plant in the world, vied strongly for public interest with the many special displays and demonstrations which featured the three days. More than 18,000 visitors, largely from the Lancaster area, and including families, friends and neighbors of the plant's 2,500 employees, participated in the event.

L. W. Teegarden, General Manager of the Tube Division of RCA Victor was a speaker at an employee rally, preceding the inauguration of the "Open House." At the rally the entire personnel rededicated themselves to unrelaxed production efforts in the war against Japan.

A highlight of the rally was the presentation of a second star for the plant's Army and Navy "E" flag, in recognition of continued achievement. The flag was awarded to the plant in April, 1944, followed by the first star six months later.

Looking ahead to postwar prospects, Mr. Teegarden said that radio and electron tubes for civilian use can be made available as rapidly as present wartime restrictions are lifted. Opportunities for continuing employment and advancement with a minimum of reconversion dislocations are better in the tube industry than in most other industries, he told employees, since tubes made during the war are much the same as those that will be made after the war.

### *Prominent Speakers at Rally*

Other speakers at the rally included John A. King, Manager, Lancaster Plant; Earl M. Wood, Manufacturing Manager; O. Richard Heistand, Manager of Personnel Department, who was master of ceremonies; Walter L. Kohr, president of Local B-1165 of the International Brotherhood of Electrical Workers, and the Rev. Dr. James E. Wagner, pastor of St. Peter's Evangelical and Reformed Church, of Lancaster, who pronounced the invocation and led the assemblage in prayer.

Built by RCA in 1941-42 at the request of the Navy, and engaged in producing the power, cathode ray, and special-type tubes which are the heart of radar and other secret military devices, the Lancaster plant had been "under wraps" until now for military security reasons.

Although some areas remain restricted, guarded chalk-line routes guided visitors to the "Open House" through a large and highly interesting portion of the plant. Attendants were stationed at all displays to explain their significance and answer questions, and armed forces personnel as well as RCA experts demonstrated the working exhibits.

Visitors saw and heard the famous RCA "Battle Announce" system used on combat vessels to flash orders and reports during major naval engagements and to communicate with landing parties under fire on enemy beaches. They saw handie-talkie and walkie-talkie radios and witnessed demonstrations of "fire control" equipment used to train anti-aircraft guns on enemy planes. They were permitted to go inside an attack bomber of the type used for strafing and dive-bombing, in the courtyard of the plant, and those who bought War Bonds were taken for rides in one of the Army's 2½-ton amphibious "ducks."

Crowds and traffic outside the plant buildings were scanned by a television camera on the roof and seen by those inside on the screens of RCA advance development models of television home receivers.

Visitors appeared before another television camera inside the plant and saw their friends on receiver screens. Both RCA Victor's large-screen (16 by $21\frac{1}{3}$ inches) and direct-viewing home receivers were used.

Buns were toasted electronically in a "cold oven" in RCA's two-kilowatt electronic power generator. In addition to this novelty application, visitors saw the generator used for its intended purpose in the rapid, uniform heating of industrial materials such as plastics, wood, and insulating materials.

The magic of the thyratron tube as an electronic switch was demonstrated by a control device especially made for the occasion, by means of which a visitor's command, spoken into a microphone, operated a phonograph record player. Visitors saw glass blowers forming technical equipment from glass and watched such operations as evacuating gases from finished tubes and fusing glass to metal. A lifeboat SOS transmitter, special displays of tube parts, tube materials, luminescent substances, and a model of the famed RCA Electron Microscope were among the other electronic wonders demonstrated or displayed.

Pointing out that tubes are the heart of all electronic equipment, Mr. Teegarden said at the rally that a growing list of new and hitherto undreamed-of civilian products and services, many of them outgrowths of wartime research, will provide important peacetime applications for tubes which have been developed for vital functions in military communications and combat equipment.

### *Tube Demand to Increase*

"It is our firm conviction," he said, "that ultimately the demand for power, cathode ray, and special-type tubes will exceed even wartime requirements. For example, from the long-range standpoint,, the advent of television on a nation-wide, and possibly a world-wide, basis holds promise of a vastly expanded demand, particularly for cathode ray tubes.

"In addition, many industries are contemplating the use of electronic heating processes which will require many, many times the power tubes currently employed by the entire radio broadcasting industry."

For the present, he pointed out, all productive effort must continue to be concentrated on the making of tubes for the armed forces.

The Lancaster tube plant provides more than 385,000 square feet of floor space. Air-conditioned and equipped with the latest manufacturing facilities, it has kept pace with rapidly changing war needs by producing many times the variety and quantity of tubes originally intended. Last year more power tubes were made at Lancaster than in any other plant in the world, and the production of cathode ray tubes was approximately double that of the next largest manufacturer.

## ELECTED VICE PRESIDENT OF RCA LABORATORIES



Conway P. Coe, formerly U. S. Commissioner of Patents, was elected Vice President in Charge of the Patent Department of RCA Laboratories at a meeting of the Board of Directors of the Radio Corporation of America, on July 6.

Mr. Coe, who was appointed Commissioner of Patents in 1933 by the late President Roosevelt, resigned from that position on June 15, 1945. He was a member of the examining corps of the Patent Office for three and a half years beginning in 1918, after graduation from Randolph-Macon College. He studied law at George Washington University and engaged in private practice in Akron, Ohio, and the District of Columbia from 1923 to 1933.

Mr. Coe served as Chairman of the American delegation to the International Conference for the Protection of Industrial Property held in London in 1934. He has been a member of the National Defense Research Committee and the National Inventors Council since the formation of these organizations, as well as Executive Secretary of the National Patent Planning Commission. He is a member of the American Patent Law Association and is a faculty member of the Law Department of George Washington University.

Mr. Coe was born at Dunkirk, Maryland on October 21, 1897. He served in the Field Artillery, United States Army during the first World War.

## RCAC Resumes Service To Six Foreign Capitals

Since mid-April, RCA Communications, Inc., has restored radiotelegraphic service to six important world capitals and, in addition, established a radiophoto circuit to Paris.

On April 13, RCAC announced the reopening of direct service to Belgium for all types of communications, followed three days later by the restoration of the Paris radiophoto circuit.

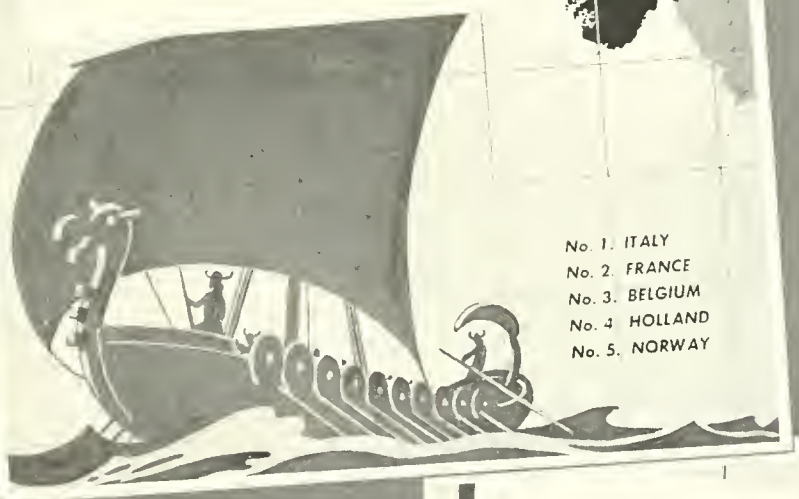
During May, commercial and personal messages were accepted for transmission to Italy, beginning May 4; Denmark and Norway on May 18, and to Holland on May 21. Erection at Manila of a new building and antenna and the installation there of new station equipment to replace facilities demolished in 1942, made it possible for Lieut. Colonel Thompson H. Mitchell, Vice President and General Manager of RCAC, to announce on June 17, the reopening of radiotelegraph service from the United States to the Philippines.

RESTORATION OF
DIRECT
RADIO-TELEGRAPH COMMUNICATION
WITH THE LIBERATED
COUNTRIES OF EUROPE

**No. 5**

# NORWAY



No. 1. ITALY
No. 2. FRANCE
No. 3. BELGIUM
No. 4 HOLLAND
No. 5. NORWAY

RESTORATION
*of*
RADIO-TELEGRAPH
COMMUNICATION
*with the* LIBERATED
AREAS OF THE WORLD

# No. 6
# PHILIPPINES




No. 1. ITALY
No. 2. FRANCE
No. 3. BELGIUM
No. 4. HOLLAND
No. 5. NORWAY
No. 6. PHILIPPINES

RCA

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